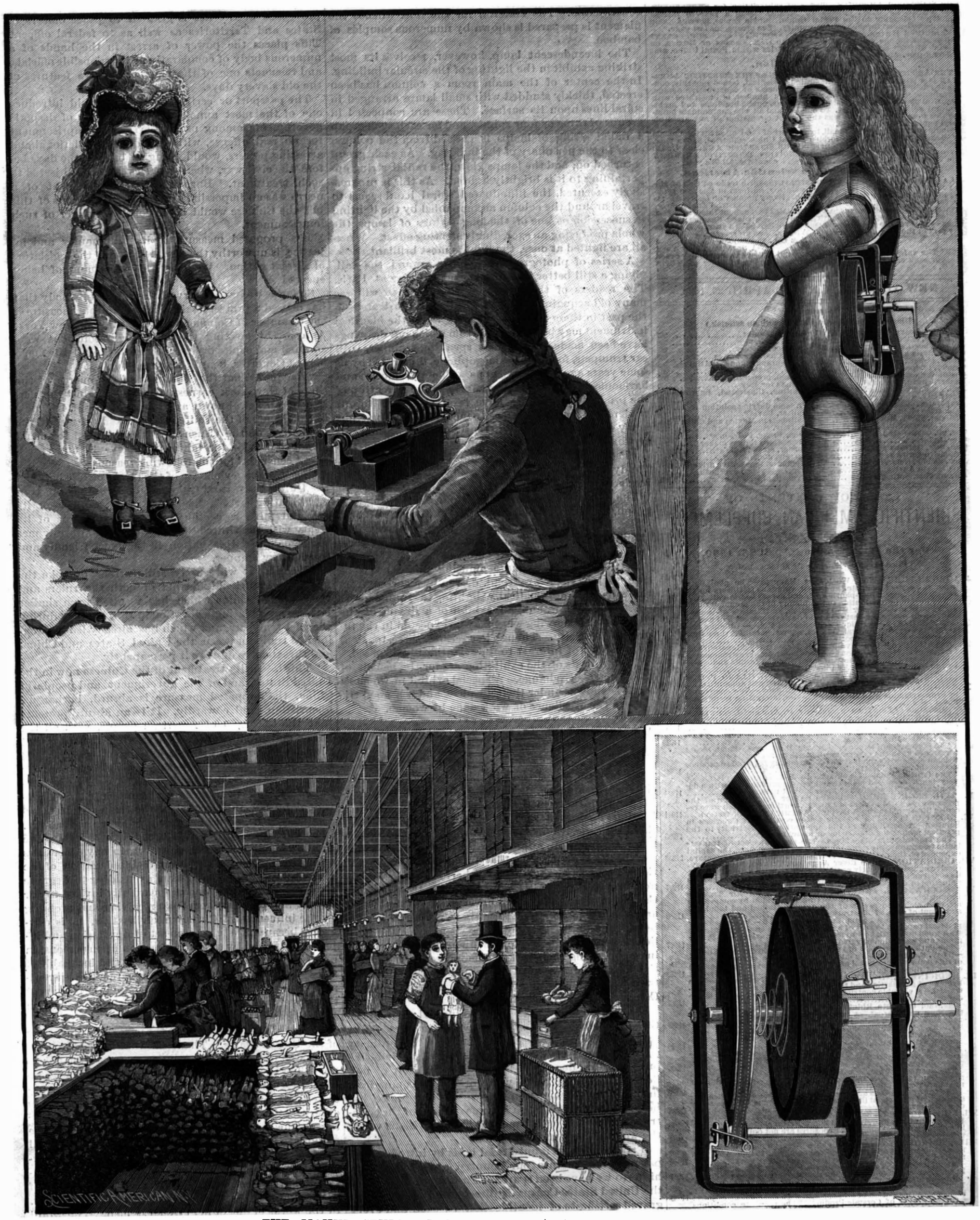
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyrighted, 1890, by Munn & Co.]

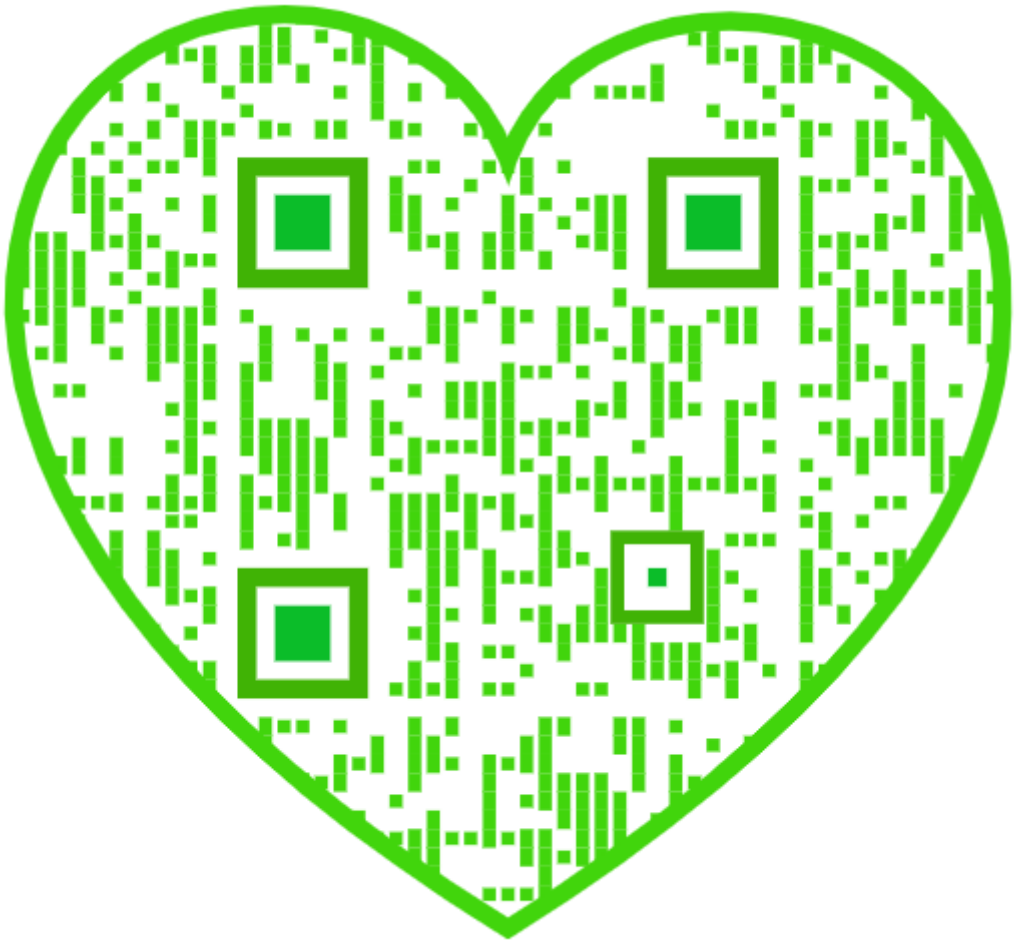
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXII.—No. 17. ESTABLISHED 1845. | NEW YORK, APRIL 26, 1890. | $3.00 A YEAR. WEEKLY.



THE MANUFACTURE OF EDISON'S TALKING DOLL.—[See page 263.]

© 1890 SCIENTIFIC AMERICAN, INC.



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico..... .....$3 00
One copy, six months, for the U. S., Canada or Mexico. 1 50
One copy, one year, to any foreign country belonging to Postal Union, 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union, *nine dollars a year*.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, $5.00 a year; combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign countries, $11.50 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number of *La America* is profusely illustrated. It is the finest scientific, industrial trade paper printed in the Spanish language. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. $3.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

MUNN & CO., Publishers,
361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

NEW YORK, SATURDAY, APRIL 26, 1890.

Contents.

(Illustrated articles are marked with an asterisk.)

Buildings, heavy, damage by....	267	Light, cheapest.....	267
Chimneys, efficiency of.....	260	Light, flash, new.....	259
Chinese, hostile legislation.....	258	Lighting, battery.....	267
City of Paris accident.....	263	Mass. Char. Mech. Ass.....	263
Closer, circuit, Dempf's*.....	261	Micro-graphophone, Bettini's*..	264
Copper, tempered.....	259	Notes, photographic.....	262
Costume, electric light.....	263	Oxygen, preparation of.....	263
Dasher, churn, Carson's*.....	261	Planets for May.....	259
Doll, phonograph, Edison's*..257,	263	Printing, illustrated, improvement.....	262
Electricity, wonders, exhibition.	258	Problem defying solution.....	267
Evaporator, commercial, Frick's*	260	Quilter, Davis'*.....	260
Explosives under percussion....	262	Railroads in Mexico and China..	264
Fastener, glove, Murray's*.....	261	Railway, stepped platform*.....	265
Faucet, measuring, Skinner's*...	261	Shoe, brake, Pearson's*.....	261
Gas, oil, oxygenated.....	262	Suggestions for gas maker.....	259
Glue, to bleach.....	261	Turner, music, Kyle's*.....	267
Gun, new, German army*.....	266	Turrets, double.....	264
Heads grow with age.....	261	Weight on locomotive drivers...	263
Jack, saddle, Garrett's*.....	260	Wires, electrical overhead.....	260
Kangaroo in Australia.....	267	Wrench, pipe, Fisher's*.....	261
Kit, drawing, Springfield*..	267		

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 747.

For the Week Ending April 26, 1890.

Price 10 cents. For sale by all newsdealers.

PAGE

I. AGRICULTURE.—Wool Wastes as Manures.—The analysis of wool waste, wool dust, etc., and their values as fertilizers for the supply of nitrogen, phosphoric acid, and potash to the soil..... 11941
The Potato.—Contribution to the history of the potato, with description of methods for its cultivation, fertilization of the soil, and how to secure the best results in its development and use..... 11938
II. ARCHÆOLOGY.—A Unique Archæological Relic.—A unique relic from San Salvador, Central America, a pipe containing three faces presumably intended as portraits..... 11942
III. ASTRONOMY.—The Revolution of Mercury.—Schiaparelli's observations and the reception awarded them by other astronomers.—A discussion of the propriety of accepting the results announced by the Italian astronomer.—1 illustration..... 11939
Transit Observations by Photography.—By WILLARD P. GERRISH.—Description of a photo-astronomical transit apparatus..... 11939
IV. CHEMISTRY.—New Zinc and Cadmium Salts.—New compounds of hydroxylamine with metallic chlorides, interesting results, and novel salts..... 11941
Separation of Zinc from Nickel.—By H. ALT and J. SCHULZE.—The precipitation of zinc as sulphide in the presence of nickel, a simple and efficient method of separation in analysis..... 11941
Synthesis of Indigo.—A contribution to synthetic chemistry having a possible future in applied science..... 11940
The Formation of Ozone by Electric Discharges.—Some recent researches upon the production of ozone from electric discharges, with an elaborate examination of the energy required to produce the substance.—4 illustrations..... 11934
The Igniting Point of Sulphur.—By J. RUTHERFORD HILL.—A very much discussed point examined experimentally, with a determination of the desired temperature.—1 illustration..... 11941
V. CIVIL ENGINEERING.—Chicago Water Supply.—Note of the present aspect of the work at Chicago, portions of which were recently illustrated in the SCIENTIFIC AMERICAN.—1 illustration.... 11931
VI. ELECTRICITY.—The Electric Decomposition of Chlorides in Solution.—A possibility of the application of electricity to the practical production of chlorine or bleaching powder..... 11935
The Transatlantic Cable Lines.—The present aspect of transatlantic telegraphy, the route taken by the present lines, the capital expended on their laying, and prospects of new lines in the future. 11936
VII. IRRIGATION.—Blyde River Aqueduct, Transvaal.—A very extensive aqueduct receutly erected in Africa, with a description of its construction and of the apparatus to be actuated by it for the reduction of gold.—5 illustrations..... 11927
VIII. MECHANICAL ENGINEERING.—Compressed Air Tramcar Propulsion.—A tramcar now working in England by compressed air, with elaborate review of the results attained and tabulated statement of data.—7 illustrations..... 11930
How to Manage a Steam Engine.—By J. C. S.—An exceedingly practical paper on the art of managing a steam engine, how to fire with wood and coal, how to manage the water supply.—With diagrams and discussion of valve setting.—12 illustrations..... 11927
The Paths of the Point of Contact of the Teeth of Gear Wheels.—By W. F. DURAND.—An interesting discussion of the geometry of this point in mechanical engineering.—The development of the curve.—1 illustration..... 11933
IX. MEDICINE AND HYGIENE.—Athletic Gymnastics.—The hygiene of gymnastics and the different types of gymnastics contrasted.—A valuable contribution to the subject of health in exercise..... 11937
Menthol in Acute Rhinitis, Influenza, and other Affections of the Nose and Throat.—A new application of the favorite headache cure.—A more serious use for it suggested..... 11937
X. METROLOGY.—U. S. Standard Weights and Measures.—A most valuable table recently issued by the U. S. Coast and Geodetic Survey, with a short discussion of the subject..... 11940
XI. MISCELLANEOUS.—An Experiment in Optics.—A further contribution to physics without apparatus.—The production of the reversed image of a body by the simplest appliance.—2 illus..... 11938
The Norwegian "Ski."—A description of this interesting snowshoe.—The racing here and abroad upon it, with scale drawings of the instrument.—1 illustration..... 11939
The Optical Illusions and Lights at Barnum's.—An English description of the optical illusions shwn in Barnum's Circus, many of which have been described in preceding numbers of the SUPP. 11938
XII. PHOTOGRAPHY.—Schirm's New Flash Light Gallery.—By Dr. H. W. VOGEL.—A description of a new Berlin photograph gallery, in which, by magnesium light, exposures are not only secured, but printing is also done..... 11933
XIII. TECHNOLOGY.—How to Make a Breast Collar, Single Harness.—Dimensions and parts required in making the piece of harness, with full instructions as to the details of the work..... 11932
Manufacture of Tapestry, Brussels, Plush or Pile, and Similar Fabrics.—A new invention for the manufacture of above fabrics... 11931
Note on a New Triple Bunsen Burner.—By F. W. BRANSON.—A Bunsen burner, admitting of the use of one or three flames, with independent regulation of air supply to each one.—2 illustrations.. 11933
On the Drying of Ceramic Products.—The requisite conditions for drying goods of this nature discussed and the necessity for giving it time pointed out..... 11932

EXHIBITION OF THE WONDERS OF ELECTRICITY.

A very interesting exhibition of the wonders of electricity has been opened at the Lenox Lyceum in this city for the benefit of the Women's Exchange. It is to a great extent an Edison exhibition. The phonograph is, therefore, a prominent feature although not an electrical apparatus. It is shown in its various capacities as reproducing music, the human voice, transmitting by telephone, etc. The new potash battery with motor is used for driving some; others are worked by treadle. Most of the Paris exhibit is shown, including the many electrical inventions that have emanated from Mr. Edison's laboratory. The incandescent lamp is shown in its parts; the process of its construction is illustrated by a series of lamps in different stages of construction. The material for the fiber whence the filament is prepared is shown by numerous samples of bamboo.

The incandescent lamp, however, receives its most striking exhibit in the lighting of the circular building. In the center of the main room a column has been erected, thickly studded with small lamps arranged in spiral lines upon its surface. These are connected in groups of three or four spirals, and for each such group a radial string of lamps is carried from the column clear to the periphery of the building. As each group is turned on, and the lamps glow, the radial string appertaining to it is brightly lighted. As this is progressively executed, the illuminated spiral band seems to travel around the column accompanied by the lighting in succession of one of the long strings of lamps, the whole producing an exceedingly striking effect. When all are lighted at once, the light is most brilliant.

A series of photographs are hung around the wall, giving a still better idea of the exact display at Paris. The readers of this paper visiting the hall will see many old acquaintances described and illustrated in the past in these columns; in some cases the identical instrument may be recognized from which our drawings have been made. The great speaking trumpet, with ear trumpets, forming the megaphone, illustrated by us some years ago, is conspicuous. The pyromotor and harmonic engine, indicating efforts in the direction of the production of work, have been presented to our readers and can be seen face to face here. A numerous array of dolls speaking different verses show practically what the phonograph can do as a plaything. The loud-speaking telephone, phonomotor or sound mill, the dynamos and meters, are also old friends of our readers.

The musical telephone, the complicated writing telegraph, and the different inventions in the line of multiplex telegraphy, are exceedingly well shown. The exhibit of the three-wire system, including all its parts and adjuncts, is of especial value.

In the lower story more amusing phases are to be seen, such as the toy railroad, driven by a current from the rails and automatically lighting a tunnel as it passes through it, and an exhibit of a dream of the 20th century, showing what may be expected in the future of electricity. Though less serious, these, too, will be an object of interest to the scientifically disposed.

The proceeds of the exhibition are for the benefit of the Women's Exchange. A special exhibit of woman's work is shown under their auspices, and is a good tribute to the excellence of work done by women.

A PROPOSED BILL AGAINST THE CHINESE IN THE UNITED STATES.

A bill, H. R. No. 6,420, has recently been introduced by Representative Morrow in the House of Representatives at Washington, designed to do its part in excluding the Chinese from this country. The policy of legislating against a race is open to discussion, and there are conceivable conditions where such legislation might seem open to approval. But in the bill of which we speak, repressive legislation seems to have run riot. Because the Chinese hitherto have generally not proved able to cope in war with troops of the Caucasian race, the assumption is made that they are a weak nation and that their rights as human beings can be infringed without penalty. The English accordingly have forced upon them the traffic in opium, doing their best to demoralize the vast Celestial empire, and a most iniquitous measure against them is now awaiting legislative approval by the Congress of the United States.

It has been found that in the industrial competition the Chinese hold their own better than in war. Sober and law-abiding, they give no hold for the ordinary course of law to strike them; economical and industrious to the last degree, and backed by an army of millions of like capacity, they are formidable competitors in the labor market. An intense race prejudice has been created against them in some sections of the country, and this bill in its most unjust provisions voices the worst element of such feeling.

It starts upon an inquisitorial basis by introducing a passport system into our country, something which hitherto we have been spared. The Superintendent of the United States Census is directed to furnish an engraved certificate of identification to each and every Chinese person found within the United States at the time of taking the census. These certificates are to be evidence of the right of the holder to remain in the United States, but not to return after having left the country. The Chinese residents are given ninety days after June 1 in which to comply with this law. After that period, if unprovided with certificates, they are to be liable to arrest, to deportation from the United States, or to be imprisoned in a penitentiary for a period not exceeding five years.

It would seem that nothing could be more tyrannical than this. But the bill goes further. The imprisonment of any Chinese person against whom a judgment of deportation has been rendered is authorized until such judgment can be carried out. This may mean unlimited imprisonment. Authority to carry out the provisions of the act is granted to peace officers of States and Territories as well as to federal officers. This places the power of arrest in the hands of a numerous body of comparatively irresponsible officials, and re-enacts one of the most oppressive features of the old slavery days.

The passport or certificate system would introduce one of the most annoying complications of despotic governments among us; the system of imprisonment for no real offense, with extended jurisdictional and arresting powers, would bring us back to the days before the civil war, when the slaves were subjected to such treatment. But unlimited confinement of a negro was an impossibility; by the provisions of this bill, the Chinese would be in constant danger of such imprisonment.

The proposed measure, by its inhumanity and injustice, is unworthy the consideration of the legislators of a great nation. We hope it has no chance of being enacted.

So far as we have observed, the only public body that has offered a protest against this iniquitous measure is the Chamber of Commerce of the State of New York. At a recent meeting the following resolutions were adopted and copies ordered to be sent to all the members of Congress, boards of trade, etc.:

"*Resolved*, That the Chamber of Commerce of the State of New York earnestly protests against the passage of an act, known as House bill No. 6,420, now in the Senate of the United States, and referred to the Committee on the Census, entitled 'An act to amend an act to provide for taking the eleventh and subsequent censuses,' for the following reasons:

"First. It is a violation of the treaty of 1880 between the United States and China, and a gross affront to a great nation, which has 'always sacredly kept its plighted faith respecting all the stipulations of its treaty with the United States,' and has uniformly met the demands of this nation in the most friendly and conciliatory manner.

"Second. It will surely still further provoke the hostile and unfriendly feeling of both the rulers and the people of China which has resulted from similar but less aggravating legislation in this country during the past ten years, and which has already led to diminished trade between the United States and China, and threatens to destroy it permanently.

"Third. In its treatment of the Chinese now in the United States, and of the government and people of China, the proposed measure is absurd, barbarous, unchristian, and cowardly. It is an absurd pretense that the 65,000,000 of American people, with all the power and intelligence which warrant the claim that they are one of the greatest nations on earth, should be in danger of contamination and debasement by the presence of 70,000 Chinese, inoffensive, quiet persons, scattered over an imperial territory, and prevented by law and by their own preferences from becoming citizens, or taking any part in our civil affairs. It is barbarous, because it submits these inoffensive people to cruel restraints, unknown to any other class of our people, or in any other civilized nation of the present day. It is unchristian, as tending to degrade these persons, whom we once cordially invited to our shores, and prevent them from receiving and profiting by the influences of Christian civilization. It is cowardly, because it is a wanton act of oppression and injustice, inflicted by a powerful nation upon persons, in numbers and in circumstances, weak and incapable of resistance. It is cowardly, as regards the government and the people of China, because it is plain that that government and that people are in no condition at this time to resent our insolence.

"Fourth. It is dangerous to the peace and prosperity of the United States. The lesson that it teaches, that the sacred obligations of treaties may be violated at the will of the Legislature, without notice, and with no effort to secure a modification of the treaties by friendly negotiation, may some time easily be applied to other treaties and by other nations to our disadvantage. The day may not be far distant when an empire of more than 300,000,000 people, apt and adroit in all the fields of science and art, brave in war, and persistent beyond all other races of men, now rapidly advancing in the mastery of all the modern resources of national greatness, will summon this nation to account. In the words of one of her strongest men, 'The world is not so near its end that China need hurry, nor the

© 1890 SCIENTIFIC AMERICAN, INC.

circles of the sun so nearly done that she will not have time to play the role assigned her in the work of nations.'"

POSITION OF THE PLANETS FOR MAY.

MARS

is morning star until the 27th, and then becomes evening star. He is in opposition with the sun on the 27th, at 2 h. 27 m. P. M., and is nearer to the earth than he has been since the opposition of 1877, when his two moons were discovered. This event is of great importance to astronomers, who hope to confirm previous observations on his ruddy disk as well as to discover something new. The best time for prosecuting the search is from May 15 to June 15. Southern observers enjoy the most favorable conditions on account of the planet's great southern declination; but northern observers will be on the watch and have the most powerful telescopes. Mars may be easily found rising in the southeast soon after 9 o'clock on the 1st, and shining as a red star of the first magnitude, while making his way among the bright stars of Scorpio. He will rise two hours earlier at the end of the month.

Mars rises on the 1st at 9 h. 25 m. P. M. On the 31st he sets at 4 h. 2 m. A. M. His diameter on the 1st is 17".2, and he is in the constellation Scorpio.

MERCURY

is evening star until the 30th, and then morning star. He reaches his greatest eastern elongation on the 6th, at 8 h. A. M., when he is 21° 18′ east of the sun. His course, as long as he is visible to the naked eye, will be interesting to observe, for the conditions are very favorable on account of his great northern declination and his nearness to Venus. The observer who wishes to see the little planet at or near elongation must command a clear view of the northwestern horizon, and begin his search three-quarters of an hour after sunset. Venus will be seen 5° north of the sunset point, and Mercury, after a careful quest, will come into view about 2½° farther north. The two planets are in conjunction on the 10th, when there is little change in their relative positions.

Mercury sets on the 1st at 8 h. 39 m. P. M. On the 31st he rises at 4 h. 32 m. A. M. His diameter on the 1st is 7", and he is in the constellation Taurus.

VENUS

is evening star. She is charming to behold, as she pursues her shining way in the northwestern sky, setting an hour and a half after the sun on the 1st, and two hours after the sun on the 31st.

Venus sets on the 1st at 8 h. 21 m. P. M. On the 31st she sets at 9 h. 20 m. P. M. Her diameter on the 1st is 10".6, and she is in the constellation Taurus.

JUPITER.

is morning star. He is in quadrature with the sun, being 90° west on the 1st, and has, therefore, completed half his course from conjunction to opposition. He is a shining light during the silent watches of the night, and when the month closes will loom above the horizon before midnight.

Jupiter rises on the 1st at 1 h. 14 m. A. M. On the 31st he rises at 11 h. 20 m. P. M. His diameter on the 1st is 37".8, and he is in the constellation Capricornus.

SATURN

is evening star. He is in quadrature with the sun, being 90° east on the 18th, at 4 h. A. M. He still hovers near Regulus, approaching the star, and coming into conjunction with it on the 29th.

Saturn sets on the 1st at 2 h. 7 m. A. M. On the 31st he sets at 0 h. 11 m. A. M. His diameter on the 1st is 17".4, and he is in the constellation Leo.

URANUS

is evening star, and continues to be favorably situated for observation with the unaided eye, being nearly 3° northeast of Spica.

Uranus sets on the 1st at 4 h. 14 m. A. M. On the 31st he sets at 2 h. 14 m. A. M. His diameter on the 1st is 3".8, and he is in the constellation Virgo.

NEPTUNE

is evening star until the 25th, and then morning star. He is in conjunction with the sun on the 25th at 8 h. A. M.

Neptune sets on the 1st at 8 h. 35 m. P. M. On the 31st he rises at 4 h. 16 m. A. M. His diameter on the 1st is 2".5, and he is in the constellation Taurus.

Venus, Saturn, Uranus, and Mars are evening stars at the close of the month. Jupiter, Neptune, and Mercury are morning stars.

MESSRS. GOODNOW & WIGHTMAN, Boston, have moved their offices and warerooms to Nos. 63 and 65 Sudbury Street, where they have more than double their former floor space. This firm are well known dealers in hardware specialties, castings of model engines, gears, and parts of models, etc., and their names and particulars as to their productions have been continuously noted in the columns of the SCIENTIFIC AMERICAN during the past fifteen years.

Suggestions for the Gas Maker.

There are several systems of gas making actually in the field which the gas engineer who desires to keep abreast of the times cannot afford to ignore, whatever may be his opinion of their intrinsic values. The recent strike of coal miners in the Lancashire and Yorkshire and Midland districts, following upon the labor troubles of the past winter, has been to many gas managers and their employers very much what the Gordon riots were to Dickens' Gabriel Varden. They have upset the monotony of their lives; and in more than one "Sleepy Hollow" of the gas industry the tremendous question has been asked, "What should we do if we could not depend upon the coal supply, and the men broke out at the same time?" Of course, it is not to be supposed that the danger of running short at once of material and men is at the present moment imminent in the gas industry, or that it is likely to become so under existing conditions. The alarmists' view of a possibility is always a distorted one; and we have no desire to take it. At the same time it must be conceded that the dull days of stagnation of trade—when men came begging for employment, and coal owners would cut each other's throats for gas contracts—seem to have terminated for the moment; so that with regard to their raw material many gas managers have lately had a closer view of a positive scarcity than they would have dreamed of as possible a year or two ago. Consequently, the mere routineer in gas making has been shaken out of his complacency, wherever the spirit of routine has not so prevailed over everything that its victim has been contented with the thought that if coal and labor failed, the district would have perforce to be put in the dark. Happily, however, this last virtue of resignation to the apparently inevitable has not recommended itself to all gas managers, many of whom are not the sort of men who easily confess to being beaten. Consequently, merely as a matter of precaution, these indomitable spirits have begun to cast about for a "second string" in case the first should snap.

The next best material to coal for gas making is undoubtedly petroleum; and closely allied to mineral oil is the shale from which paraffine oil may be extracted. Quite recently an inventor has tried to do something with oil gas of a quality too rich to be burnt in the ordinary way. We used to hear more about mineral oil gas requiring to be diluted with air, in the days before Mr. Lowe made water gas commercially successful in the United States. The drawback to this class of illuminating gas was that a very little air made a great difference in the illuminating value of the mixture; and consequently the pure oil gas, rich as it was, would not bear dilution. Now the same idea has been revived, with the difference that a small percentage of oxygen, rendered available by Mr. W. A. Valon's adaptation of the Brin process, is to be mixed with the rich gas, in order to render it readily combustible. Students of our "Register of Patents" will have noticed, a couple of months ago, that a Mr. S. Tatham has patented a notion of this kind, for what he has called "carbureted oxygen" gas. Now we have not the least desire to discourage anybody who thinks to improve coal gas or oil gas as a fuel or as a means of lighting; but it must occur to the veriest tyro in chemistry that "carbureted oxygen" gas might very easily become a ticklish compound to approach with a naked light. Mr. Tatham contemplates adding 2½ per cent of oxygen to 16 candle gas; but this would scarcely be a profitable thing to do. If anywhere, the profit would be found in mixing oxygen with very much richer gases; but the more oxygen, the greater danger.

It is not, of course, that a hydrocarbon gas to which oxygen is added in the proportions contemplated by Mr. Tatham is in itself a dangerous compound. Supposing the mixture to be perfect, to stand without stratification, and travel without separation, it is conceivable that the addition of 10 or 12 per cent of oxygen to a heavy hydrocarbon gas would appear like a great improvement to the latter. The question arises, however, as to the sufficiency of the margin of safety in such a case. Is it impossible that somewhere or somehow the oxygen and hydrocarbon would bear to each other a hazardous ratio? Brin's oxygen process is now so pretty, in a technical sense, and its possibilities are so vague, that one is naturally indisposed to allow any application of it to pass unchallenged when it seems to lead to unnecessary risks. Plenty of uses for oxygen, to which no exception can be taken, will no doubt be found in time; but it will be necessary to make sure of the stages of any project for mixing it with hydrocarbon gas with a view to burning both from one orifice.

Water gas continues to occupy a tentative position in this country. It has transpired that the Meeze process, which Mr. G. C. Trewby seemed to think rather well of when he saw it in America, is practically identical with the Avery gas process, which did not precisely carry conviction to all observers of its trial at Cleckheaton. It is being tried again in the Chartered works—of course, at the expense of the projectors; but it is too soon to say with what result. The Van Steenbergh experimental works at Knightsbridge are now trying what can be done with Russian petroleum of 40° Baume (or 0·829 sp. gr.) and common gas coke. The working of this plant must be allowed to be simplicity itself. The tall "coffee pot" generator, already described in these pages, is almost filled with coke, which is "blown up" by means of an air blast for about 20 minutes, until the sight holes show the interior to be a mass of white-hot carbon. Then steam at 100 pounds pressure, dried by passing it through a superheated coil exposed to the heat of a slow coke fire, is injected under the grate; and at the same time a supply of petroleum from an elevated tank is admitted through pipes to the middle of the contents of the producer, and the exhauster started at top speed. After a quarter of an hour of this, the test burner begins to be smoky, showing that the process of reduction has gone far enough. Then the very deliberate attendant changes the process to "blowing up" again, and so with alternate stages of gas making and blowing the holder rises. The consumption of petroleum, costing 4d. per gallon, is somewhere about 3 gallons per 1,000 cubic feet of 22 candle gas; but as these experiments with comparatively heavy oil are not complete, it will not be safe to say much about weights and quantities. Leaving these for the moment, the most striking features of water gas making to any one accustomed to the hard work and noise of a coal gas works is the practical disappearance of the labor queston. A quarter of an hour suffices to make between 2,000 and 3,000 cubic feet of gas at Knightsbridge, when there is an equal period appropriated to "blowing up," during which the same man might attend to a couple of other producers. There is no clinkering—the steam neutralizing this part of the furnace work; and consequently the stoker and the fireman disappear, to make room for a calm, intelligent mechanic, "clothed and in his right mind," and quite competent to tell when he is well off.

Besides the proposed utilization of petroleum in water gas manufacture, it is employed, so it is said, to improve the illuminating form of coal gas where cannel is short or a specially good make is desired. This is done in the most successful example, it is reported, by Mr. R. Good, of Carshalton, who injects a little petroleum into his retorts when the charge of coal has been half burnt off. It is not the first time that petroleum has been used to improve gas as made in the ordinary way; but the peculiarity of Mr. Good's arrangement is that the addition is made upon the coal when it is in a peculiarly fit condition to receive it.

All these evidences clearly go to show that gas engineers need not sit down and despair because of incidental troubles from without or within the works. Resourceful men make difficulties their opportunities, and feel in rising to the occasion during a period of trial a satisfaction not to be eclipsed by the sluggish contentment of ordinary experience, when the calm surface of routine working is unruffled by a ripple.—*Jour. of Gas Lighting.*

New Flash Light for Photographing.

At a regular meeting of the Washington Chemical Society, held recently, Dr. Thomas Taylor, of the United States Department of Agriculture, exhibited a new flash light intended to take the place of several kinds which have of late proved highly dangerous in practice. The composition of Dr. Taylor's new flash light consists largely of charcoal made from the silky down of the milk weed, a form of carbon which he prefers to all others, because of its freedom from ash. A few grains of this new composition placed on tissue paper and lighted by a punk match produced a prompt and blinding flash, while it was observed that the paper on which the powder rested was not even scorched. The flash being instantaneous, the heat is not sufficient to ignite the most inflammable material on which the powder may rest. Dr. Taylor demonstrated this by using, with the same paper for a base, an inferior flash light, which set fire to the paper at once. This is owing to the comparatively slow combustion of the chemicals used in the inferior grade. Dr. Taylor said that the powder of his new flash light will not explode either by concussion or friction.

Tempered Copper.

That copper was hardened or tempered by the ancients, no one can doubt, as samples of edged tools and relics of all kinds have been found, composed of pure copper, and are on exhibition in all collections. It is interesting, therefore, to learn that the Eureka Tempered Copper Company, of North East, Pa., claims to have discovered this process, and to be able to supply the trade with any and all kinds of copper cast solid, tempered to any gauge that the work expected of them demands.

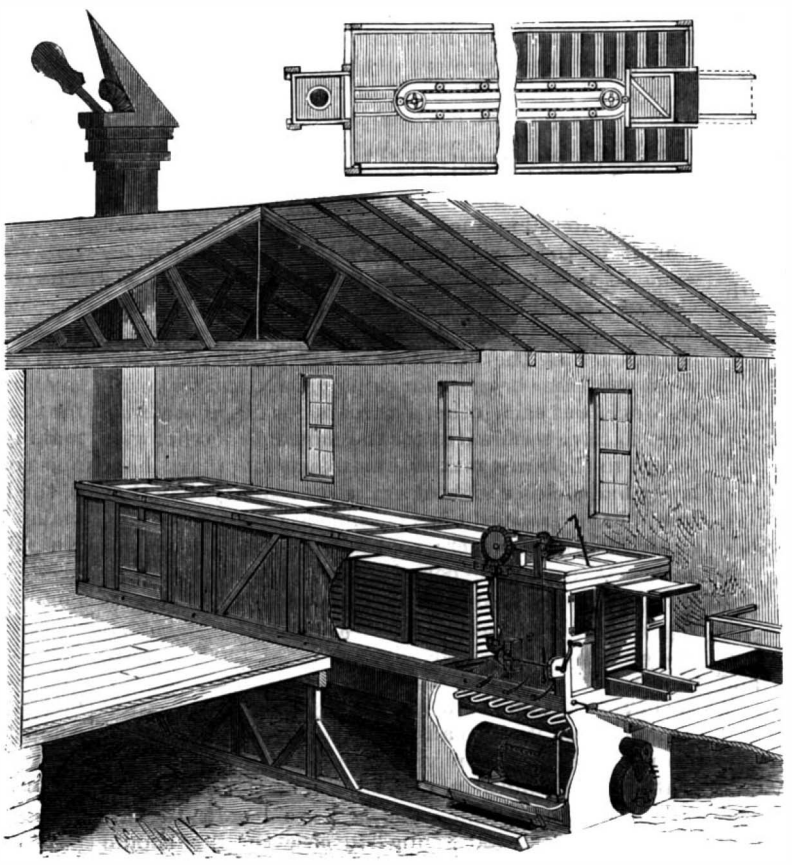
PRESERVE FOR BINDING.

The publishers of the "Scientific American" would advise all subscribers to preserve their numbers for binding. One year's issue (52 numbers) contains over 800 pages of illustrations and reading matter. The practical receipts and information contained in the Notes and Queries column alone make the numbers worth preserving. Persons who have subscribed since the commencement of this year can have the back numbers sent them on signifying such wish. Their subscription will then expire with the year.

© 1890 SCIENTIFIC AMERICAN, INC.

FRICK'S COMMERCIAL EVAPORATOR "SIMOON."

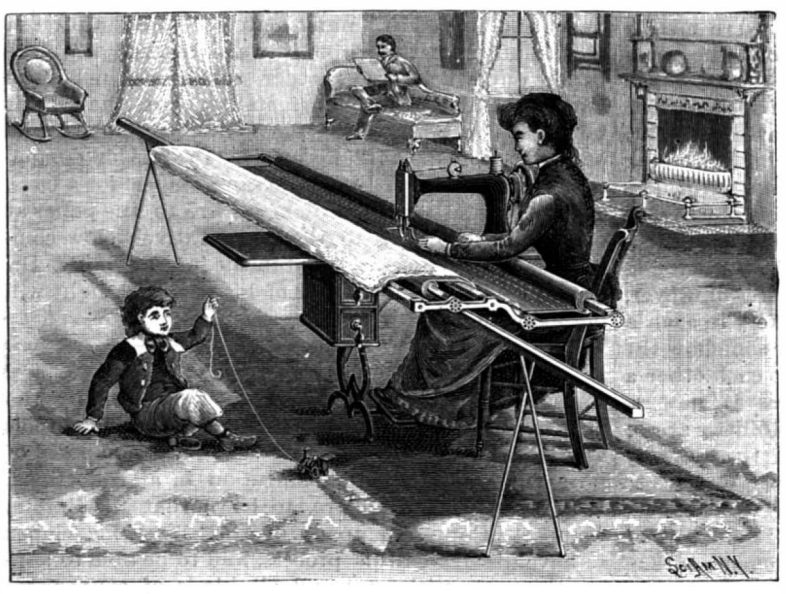
The accompanying illustration forms the subject of patents recently granted in the United States, Canada, and European countries to Messrs. Geo. and Fred. Frick, mechanical engineers, Waynesboro, Pa. It is an evaporator specially designed for drying cut fruits, or raisins, prunes, coffee, cocoa, tea, hops, etc., at a minimum cost. The trays containing the article to be treated are inserted in crates, or carriers, which are carried on friction rollers longitudinally through the evaporating chambers around a central wall by means of a crank, sprocket wheels, and chains. The evaporator has a telescopic vestibuling device, by means of which every tray carrier or car, when receiving its complement of fresh fruit trays, or when being emptied, is isolated from the evaporator, thus permitting the machine to be operated without ingress of cold air, or waste of hot air therefrom, or exposing the operator to the heat and retarding the drying of that already entered. In the drying process especial provision is made for carefully regulating the temperature, and the velocity of the currents from the initial or starting point to the finish, the drying being continuous and uniform from a higher to a lower temperature. As the tray carriers are filled at stated intervals, their position in the machine determines with accuracy the exact or relative condition, or forwardness, of the product they contain. In these respective positions they are uniformly subject to such atmospheric conditions of temperature and humidity as years of experience have shown most productive of good results. Steam heat or hot air furnaces may be used to provide, at the will of the operator, a hot, dry current, or a gentle warm breeze, or for special purposes (such as in drying raisins, prunes, etc.) exactly the reverse process. By operating the crank the other way, the initial or starting point is made at the lowest temperature and the finish at a higher temperature, thus avoiding the bursting of skin fruits and consequent drip. The machine is easily operated, because the trays are entered in groups of twenty at a time at regular intervals, varying from twenty to sixty minutes. It has been practically tested on domestic fruits, and is already in use in tropical sections for cocoa, coffee, etc.



FRICK'S COMMERCIAL EVAPORATOR "SIMOON."

AN IMPROVED QUILTER.

The accompanying illustration represents an invention affording a regular attachment to all family sewing machines. By its use it is designed that one lady will be able to make a large, six-pound comforter within less than one hour on her own sewing machine, and also conveniently do all kinds of quilting, such as coat linings, dress skirts, cloaks, etc. In this attachment the lining of the quilt is rolled up on one roller and the top is rolled on another roller near the needle of the machine, the cotton being placed on the lining, one layer at a time, as the quilting is made. Every time a line is made the operator loosens one roller and rolls up on the other, these operations being repeated until the quilt or comforter is made. It is a very simple yet extremely serviceable attachment, designed to supply the wants of all who have work of this character to perform. This quilter is manufactured by the inventor, Henry T. Davis, at No. 66 Warren Street, New York City.



DAVIS "1889" QUILTER.

THE Buckeye Street well, in Toledo, O., has struck gas at 1,440 feet, with 75 feet in the Trenton. No trouble has been had or is anticipated from salt water.

Overhead Electrical Wires in Large Cities.

A committee of the Senate of New York State has lately examined the subject of overhead electrical wires for city streets, with a view to the formulation of laws for the better protection of life and property. From the committee's report we make the following abstract;

"Representatives of the various electric lighting companies, city officials, prominent experts, and others who might be able to give information regarding the recent deaths in New York were called as witnesses. The depositions of Dr. William Thompson, of Glasgow, Scotland (conceded by the experts who testified to be the foremost electrician of the day), Dr. John Hopkinson, Prof. George Forbes, and William H. Preece, all of London, England, and eminent electricians, were received. These depositions, together with the testimony of several of the witnesses, gave valuable information as to the electric lighting business in the large cities of England and the Continent of Europe and the methods adopted there to prevent accidents.

"It appears that substantially all of the electric lighting from central stations in this State is done under one of the three following systems: (1) the low tension continuous current system; (2) the high tension direct current system; (3) the alternating current converter system, involving the use of 1,000 volts or more in main wires, which is reduced by means of converters to 50 or 100 volts on consumers' wires. There are two dangers from electric currents: First, the danger to property from fire, and second, the danger to life from shock. Difference of opinion exists among experts as to what voltage would cause death or whether there is any difference in the danger to life between alternating and continuous currents. It seems to be conceded, and may be taken as a safe rule, that currents of 250 volts or under, either direct or alternating, are safe.

"It appears that sixteen persons have been killed in the city of New York during the past three years, from electrical currents, most of them being employes of electric lighting companies. Most, if not all, of these deaths were caused by a continuous current used for arc lighting. As far as the committee could ascertain, no accident has been caused by underground conductors. The causes for most of the deaths appear to have been carelessness on the part of the electric companies in using poorly insulated or badly arranged conductors, and in neglecting other precautions required for safety. It appears doubtful if an overhead system of wires carrying high tension currents could be under any circumstances maintained in the crowded streets of the city of New York without more or less danger to the public.

"The remedy for these evils, in the opinion of your committee, lies in the speedy burial of all electric light and power conductors in New York City and other cities having a population of 125,000 or more, and the enforcement in all cities and towns where central station electric lighting is carried on, of such rules and regulations as shall compel the companies to properly construct and maintain their plants and adopt such precautions as are required to insure safety to the public.

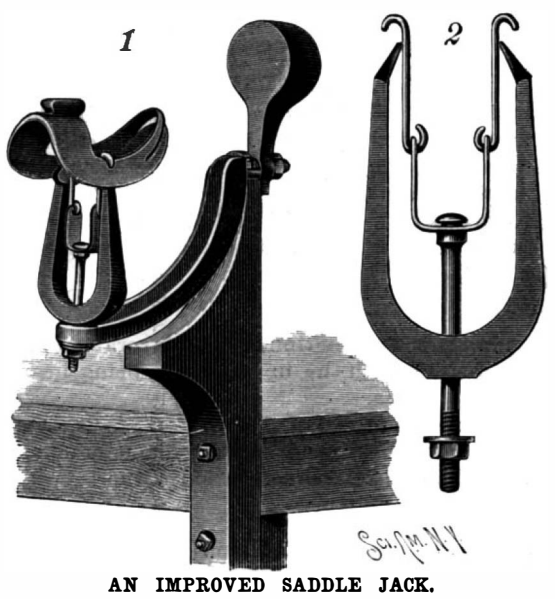
"As already indicated, there are two questions upon which the Legislature might properly act by providing: First, that no electric light or power current of over 250 volts pressure be allowed to enter any building; second, that after say January 1, 1892, no overhead conductors carrying currents for lighting or power purposes be allowed in any street, highway, or public place in any city of the State having a population of 125,000 persons or over; and that the local authorities in the various cities coming under this description, in the absence of any State authority, be empowered and directed to make proper provision for the burial of such wires."

The Efficiency of Chimneys.

The *Journal du Gaz et de l'Electricite* quotes from a German source some experiments upon works chimneys. An old chimney, 67 feet high, with internal diameter of 19·6 to 13·8 inches, and with total passage, from fire to chimney top, of 98 feet, was taken down, and a new chimney, with an intended total draught of 95 feet and a minimum internal diameter 25·5 inches, was planned out. When the chimney had gone up 39 feet, it was tried. Already there was a great improvement on the old chimney; again at 46 feet, still better, and at 52½ feet the draught was excellent, the smoke issued clean, without soot, and there was an economy of from 15 to 20 per cent in fuel. So the chimney was finished off at that height. Herr Huth thinks chimneys are usually made too narrow, and the mischief is aggravated by increasing their height, so fuel escapes unburned. Herr Ramdohr, of Gotha, confirms this, and recommends a uniform internal diameter as being more rational, and as protecting the brickwork from the hot and rapid axial stream. The cross section of the chimney should be from one-fourth to one-eighth the grate area, and the height, not less than 50 feet, should not exceed 100 to 120 feet (the diameter being made to suit), unless the chimney is at a distance, in which case it may be 160 to 200 feet, the diameter being regulated according to the amount of soot which escapes.

GARRETT'S SADDLE JACK.

The device shown in the accompanying cut is designed to support the saddletree while the operator covers it and finishes the saddle. It has been patented by Mr. Richard Garrett, Hico, Texas. In the upper end of a post adapted to be secured to a work bench is formed a journal in which a pin is mounted to turn, this pin being rigidly connected at its front end with a curved segmental arm, while on the rear end of the pin is an upwardly extending arm carrying a weight. In the lower front end of the curved arm is mounted to turn a trunnion supporting a U-shaped post, as shown in section in Fig. 2, having on its upper ends plates adapted to support the saddletree. The tree is securely held in place by hooks connected with a U-shaped plate pivoted on the upper end of a bolt passing through the hollow trunnion, and having on its lower end a nut. When the saddletree is in place on the U-shaped post, as shown in Fig. 1, this post can be conveniently turned, while the curved arm with the post can be swung either to the right or left, the counterbalancing weighted arm holding it in position, whereby the operator is enabled to finish the entire saddle without once removing the saddletree from the saddlejack.

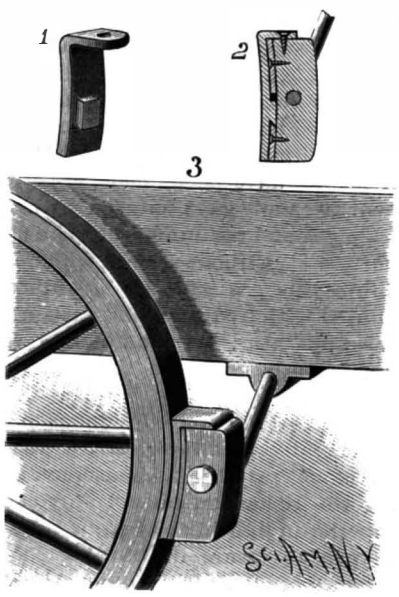


AN IMPROVED SADDLE JACK.

© 1890 SCIENTIFIC AMERICAN, INC.

AN IMPROVED BRAKE SHOE.

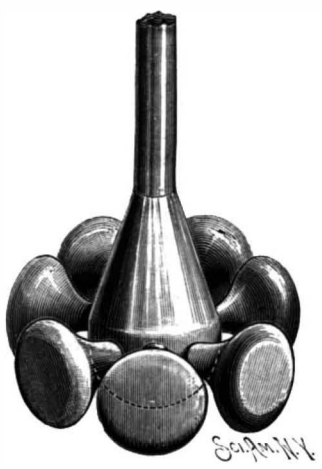
The device represented herewith is designed to be cheap and durable, and the shoe, when worn, can be quickly and easily replaced by a new one. It is a patented invention of Mr. Nels K. Pearson, of 230 Perry Street, San Francisco, Cal. To the brake block is attached by screws, as shown in Fig. 2, a face plate having a rectangular slot or opening, the lower wall of the slot being beveled. The outside plate, shown in Fig. 1, has a projecting shoulder just fitting the slot in the inside plate, the shoulder having a downwardly extending edge which fits the bevel in the inner plate, so that when the shoulder is slipped into the slot, the two plates are securely dovetailed together. The outside plate also has at the top a cap overlapping the top of the inside plate and the top of the brake block, to which it is attached by a screw. In Fig. 3 the brake is shown attached to an ordinary brake shaft.



PEARSON'S BRAKE SHOE.

AN IMPROVED CHURN DASHER.

The dasher shown in the illustration has been patented by Mr. Benjamin F. Carson, of No. 216 Stonewall Street, Nashville, Tenn. It is made with a rounded-off, pear-shaped center piece, with a series of rounded knobs projecting in a circle from the center piece. By this construction no sharp corners are presented to the milk in operating the dasher, whereby it is designed that the butter globules will not be broken and a better quality of butter will be produced.



CARSON'S CHURN DASHER.

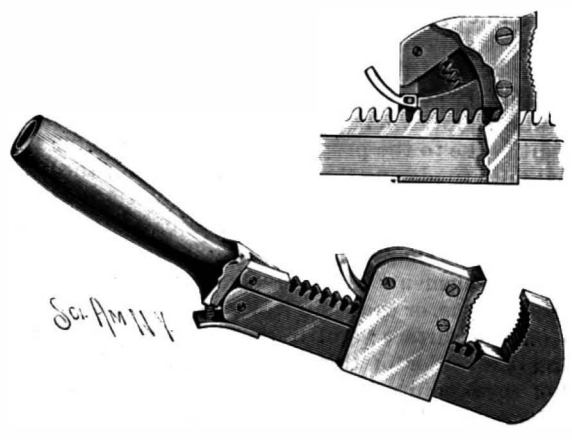
To Bleach Glue.

A writer in the *Monit. Sci.* says that to add oxalic acid and white oxide of zinc, in the proportion of one per cent to the glue to be treated, gives a whiter and clearer product than any of the measures now in use. The glue should first be reduced with water and heat to a thick pulp, and the chemicals added while the mass is hot. The same process may be used for bleaching blood albumen, but the degree of heat should not be above 122° F., or the albumen will coagulate.

AN IMPROVED PIPE WRENCH.

An invention designed to be equally applicable to monkey and other wrenches not specially made to grip pipes, and under which the gripping surfaces of the jaws may be variously constructed, is illustrated herewith, and forms the subject of a patent issued to Mr. Thomas W. Fisher, of Helena, Montana. The adjustable jaw head has a serrated jaw piece in front, facing the outer jaw, the inner jaw head being moved along the shank by a rack bar fitted to slide upon the shank, and pivoted at its inner end to a handle, which is in its turn pivoted to the stock.

This hinge or pivoted handle forms a lever by which to throw the rack bar backward and forward. The inner jaw head is connected with the rack bar by an automatically locking toothed catch pivoted in the head, as shown in the small view, and acted upon by an exterior thumb piece to disengage it from the rack bar when it is required to independently slide or adjust the jaw head up to its work, or to gauge the jaws before working on the handle lever. A coil spring normally causes the handle to throw forward. This independent adjustability of the sliding jaw head provides for quickly adjusting the wrench to its work, when the strain is exerted against the end of the sliding rack bar bearing up against the outer shoulder on the shank, its inner end pressing up solid against the handle.



FISHER'S PIPE WRENCH.

Do Heads Grow with Advancing Age?

Some amusing letters have appeared in a daily contemporary in regard to an alleged steady increase in the size of Mr. Gladstone's head, which, it is said, is rendered manifest by a progressive enlargement in the size of the hat required to cover it. The correspondence exhibits an extraordinary ignorance of well ascertained facts; for, if there is one thing which would be acknowledged by all anatomists and physiologists, it is that the nervous system, like other parts of the body, undergoes atrophy with advancing age—an atrophy that pervades every tissue, and is as apparent in the thinning of the vocal cords that alters the voice to "childish treble," as in the shrunk shanks for which the "youthful hose, well saved, are a world too wide." No reason can be assigned why the brain should escape the general change that affects the digestive and the circulatory systems alike. Its attributes and faculties attain their highest excellence at or before mid-age, and from that time forth exhibit only a steady decline. To compare Mr. Gladstone with Napoleon, respecting whom a similar story is related, is absurd. The head of Napoleon may have grown between twenty and forty-five, because his brain was greatly exercised during the last ten years of the past century and the first ten of the present; but no calls have been made on Mr. Gladstone of late years at all comparable to the strain on the mental and bodily powers of the French emperor during that eventful period. The ossification of the sutures of the cranium practically prevents increase of the volume of the brain in advanced life; and, even granting some slight increase, such increase would be compensated for by the attenuation of the cranial bones, which is well known to occur in old age. A change in form there may be, but none in size.—*Lancet.*

AN IMPROVED SHOE OR GLOVE FASTENER.

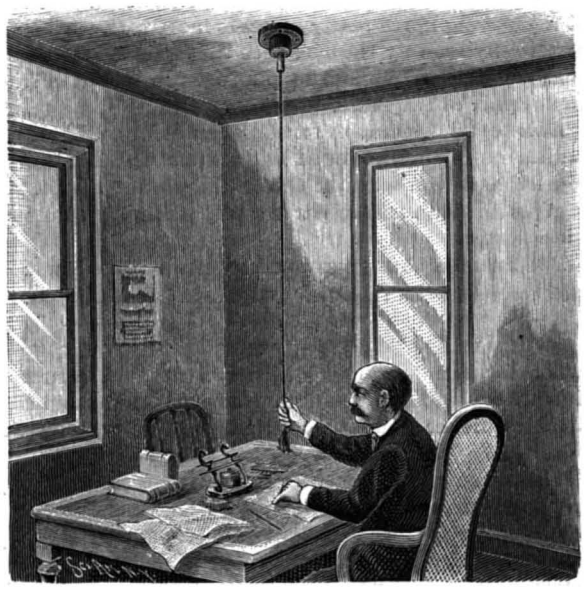
The accompanying illustration represents a device designed for rapid and convenient manipulation for buttoning a shoe or glove without damage to the buttonholes. The invention forms the subject of a patent issued to Mr. James C. Murray, of Scranton, Miss. The device has a curved spring foot, to which is attached a shank having gripping jaws, a presser bar being journaled above the gripping jaws, the jaws and the presser bar being operated when the spring foot is contracted by means of its upwardly extending handle. The flexing of the spring foot causes the jaws to move slightly outward, whereby the fly is pulled well over the button, the latter acting as a brace or fulcrum, whereby the button is forced upward through the buttonhole in a favorable position to receive the button.

AN IMPROVED MEASURING FAUCET.

A faucet for automatically drawing and measuring different quantities of fluid from a barrel or other reservoir is shown herewith, and has been patented by Charles Skinner, M.D., of Pearsall's, N. Y. Within the spigot is a longitudinal horizontal partition, dividing the outer part of the spigot in front of its plug valve into upper and lower channels, the lower one being closed at its outer end, and communicating with the interior of the barrel. The upper channel, cut off by the partition from the lower one and the barrel, communicates with a suitable end spout, from which liquid is discharged from the measuring vessels. These are preferably sheet metal vessels, of capacities varying as desired, and each is detachably connected to the nipple of a sleeve adapted to partially rotate upon the outer part of the spigot, the series of sleeve couplings being adapted to be forced closely together to maintain perfectly tight joints. A series of holes through the bottom wall of the spigot establish communication between the lower one of its two channels, through the coupling nipples to the interior of the pendent measuring vessels, while a diametrically opposite series of holes in the upper wall of the spigot open communication between the upper channel and any one or more of the measuring vessels which may be turned bottom upward above the spigot. A vent tube is provided at either end of the top channel to insure a free and unbroken discharge of its contents, and a stop is also provided for sustaining the measuring vessels in uppermost position for discharging their contents into the upper channel of the spigot.

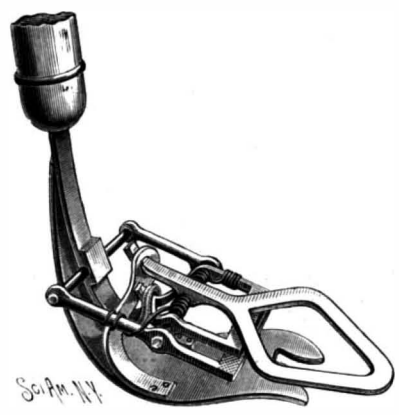
AN IMPROVED CIRCUIT CLOSER.

In the accompanying illustration is shown the application of a recently patented device to permit of the closing of an electric circuit by pulling on a suspended tassel instead of by pressing on a push button, as is the ordinary practice. In this device a non-conducting



DEMPF'S CIRCUIT CLOSER.

block of wood or similar material is employed, and bored out with three different diameters, the largest at the top and the smallest at the bottom. At the bottom of the upper and largest bore are placed two detached segments of a metal ring, the segments being insulated from each other and forming the terminal contact plates of the two circuit wires. A hollow metal stem, having a disk at its upper end fitting the largest bore, extends down through the block, there being coiled around the stem a spiral spring bearing at its upper end against the disk and at its lower end against a plate in the bottom of the intermediate bore of the block. This spring normally holds the disk on the upper end of the stem away from contact with the

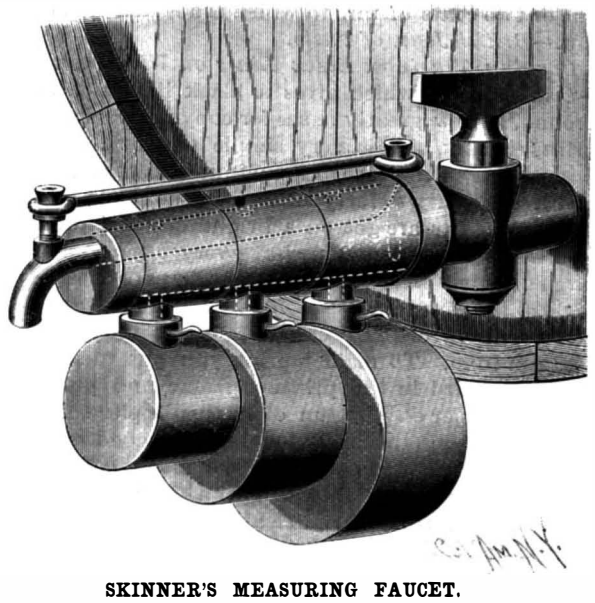


MURRAY'S SHOE OR GLOVE FASTENER.

segmental plates, the downward pulling of the stem, against the tension of the spring, bridging the break between the plates to close the circuit through the wires. This device may be used in other positions than as represented, or it may be connected to the ordinary pull knob of a front door bell without the change in the knob which an electric door bell ordinarily necessitates.

This invention has been patented by Mr. Joseph A. Dempf, of No. 807 North Capitol Street, Washington, D. C.

AT a recent test of search lights for the purpose of discovering an approaching enemy dressed in uniforms of various colors, it was found that the red uniforms were very distinct, blue being the least conspicuous.



SKINNER'S MEASURING FAUCET.

© 1890 SCIENTIFIC AMERICAN, INC.

PHOTOGRAPHIC NOTES.

Hurdle Photographs.—From Mr. C. D. Kirkland, of Cheyenne, Wyoming, we have received a number of interesting photographs taken instantaneously, of Western horses in the act of jumping hurdles and trotting, which depict very clearly the curious positions they assume that are unobserved by the eye. The photograph of a jumping horse really appears more awkward than as actually seen by the eye, since the latter sees the continuous motion, while the photograph is but a fractional part of the same.

Eikonogen Developer for Lantern Slides.—Later experiments with eikonogen show that while it works somewhat slower without the addition of an alkali, yet it gives better results, particularly with slow lantern slide plates.

The formula that gives good results is as follows:

Eikonogen	10 grs.
Sodium sulphite (crystals)	20 "
Distilled or rain water	1 oz.

This forms a developer which will develop in succession six or seven lantern slide plates without stain and a trifle quicker than the ordinary hydroquinone developer.

It also allows for any trifling overexposure that may have been made.

In making lantern slides, it is advisable to slightly overexpose, in order to bring out the details in the dense portions of negatives. Until some practice is acquired, trial exposures must be made to find the correct time. A thin negative requires a short exposure, a dense negative two or three times as long, and where the negative is over-dense in one part, a brief exposure may be made for the thin portion, which is then masked or shielded from the light with a piece of paper, and an exposure five times as long continued. On development the picture should come out evenly. Usually thin negatives full of details make the best lantern slides.

It has been the experience of many amateurs that after lantern slides have been mounted for some time, there comes a mottled film of moisture on the inside of the cover glass which interferes with its transparency in the lantern. To overcome this defect has been the study of many for some time. It is advised that the lantern slide be warmed slightly, and then coated with a collodion film. Also that the side of the cover glass that is to adjoin the slide be heated, to drive off any moisture on its surface, and then coated with a collodion film.

Making Oxygen Gas for Lantern Use.—The *British Journal of Photography* reports a series of experiments on the best way to eliminate the chlorine gas evolved in the making of oxygen gas, and suggests a plan for absorbing the chlorine that is more effective than the ordinary wash bottle. It says the addition of permanganate of potash performs this function, and recommends the following mixture:

Chlorate of potash	1 lb.
Black oxide of manganese	1 oz.
Permanganate of potash	31 grs.

After the gas has been made, the above mixture is thrown into water, which dissolves the potash salts. It is filtered, the black oxide of manganese is saved, dried, and used over again.

Producing gas without the wash bottle thus simplifies the process and makes it much more convenient, especially in forms of apparatus where the gas is used nearly as fast as manufactured. In such cases a cylindrical sheet iron retort holds the salts, which are heated by a lamp moved along underneath. Usually the operator tells by the sound of the bubbling of the gas through the soda solution in the wash bottle when the gas is evolved or when it stops. In dispensing with this signal, it will be difficult to tell when the gas ceases, except by observing the condition of the gas bag or gasometer. It is probable the gas will come off more dry, and therefore be of better quality.

Repairing Leaky Skylights.—Instead of repainting the outside of the sash bars with oil paint, give them one or two coats of tar, to which is added a little tallow.—*British Jour. of Photo.*

Copying Tracings, Black Lines on White Ground.—*Cola's Process,* which gives a black line on a white ground, is now greatly in use for copying tracings. It prints quickly, and is very simple to work. The exposure ranges from five to ten minutes in the sunlight, and from twenty to forty minutes in the shade. I find the best results are got on a bright day and printing in the strongest light. I have very often to reduce large drawings made on yellow tracing paper to a small scale to transfer to a stone for lithographic purposes, and use this process to get a more suitable copy to photograph from. To make a print, you put the tracing face downward in the printing frame, and place the sensitive paper on the top of it, then a piece of thick felt, and then the backs, and put a good pressure on by means of screws, which are much better than springs, as you are able to get a more even pressure. To ascertain if sufficiently printed, lift up one corner, and if the greenish yellow tint has disappeared, except where covered by the lines, it should be taken out and immersed, face upward, in a bath composed of gallic acid 20 parts, alcohol (methylated) 200 parts, and water 1,000 parts, and remain for about three minutes, at end of which time the lines will be up strong and black. It should then be thoroughly washed in running water for a quarter of an hour, and surface rubbed with soft sponge, then taken out and hung up to dry. The following will be found a good formula for sensitizing the paper:

Water	300 parts.
Gelatine	10 "
Perchloride of iron	20 "
Tartartic acid	10 "
Persulphate of zinc	10 "

Apply this by means of either a broad, flat camel hair brush or a fine sponge to a hard, well-sized paper, then hang up to dry in a dark room. To overexpose a print means losing the lines, and underexposure gives a very dirty, neutral tint ground and very faint lines.

To Blacken Metal Diaphragms.—Clean the metal first with a potash solution, then immerse in a solution of nitrate of copper, and heat over a Bunsen burner. A second application is sometimes desirable. The heat produces the black color.

Explosives under Percussion.

BY A. WERNER CRONQUIST, STOCKHOLM.

In order to ascertain the degree of sensitiveness to concussion of certain explosives in use in Sweden, I have made some experiments on samples of from 0·15 to 0·70 grm. The samples, at a temperature varying between 15° to 22° C., were placed between steel faces, which were then struck by the falling weight, and the following figures in kilogrammeters and foot pounds give the minimum impact which resulted in explosion:

	Kilogrammeters.	Foot Pounds.
Nitro-glycerine, fluid	0·41	2·8
" frozen	0·80	5·6
" partially frozen	0·27	1·9
Dynamite (72 per cent nitro-glycerine)	0·50	3·5
Blasting gelatine (96 per cent nitro-glycerine)	0·60	4·2
" (90 per cent nitro-glycerine, with camphor and nitro-cellulose)	1·80	12·6
Ammonia powder (ammonium nitrate, nitro-glycerine, and charcoal)	0·55	3·8
Sebastine (nitro-glycerine, nitrate of soda, and charcoal)	0·70	4·9
Guncotton (dry)	0·82	5·7
" with 20 per cent of water	2·30	16·1
Nitro-cellulose, soluble	0·72	5·0
Romite (ammonium nitrate, potassium chlorate, naphthaline, and paraffine)	0·60	4·2
"Romite Maritime" (nitro-lactine)	1·90	13·3
Gunpowder, fired	37·50	225·0
Bellite (ammonium nitrate and nitro-benzene)	62·00	437·0
In copper cartridge: Gunpowder, explosion	72·00	507·0
Bellite, neither exploded nor fired at	292·00	2077·0

Improvement in Illustrated Printing.

The April number of the *Century Magazine*, just issued from the press of the De Vinne Press Company, of New York, is not only its usual unsurpassed monthly triumph of typographical and illustrative art, but demonstrates the perfection of a new adaptation of printing from curved electrotype plates, which has never been heretofore applied successfully to a high class illustrated magazine or newspaper, and which success, now fully demonstrated, promises to revolutionize the printing trade as effectually as any past invention has done.

The curved plates used are the inventions of Mr. P. M. Furlong, of this city, now at the head of the electrotype foundry of the De Vinne Press, and who left here in 1886 to take charge of the electrotype foundry in the government printing office, and built it up from an insignificant affair to the largest and most complete plant of the kind in the whole world. Mr. Furlong's invention, as used in making the *Century* plates, consists essentially in the use of a resilient plate in connection with a bending cylinder provided with bearers to relieve the crushing force necessary to reduce the flat plate to its proper curved form. No heat being used in the process, this simple and effective idea has resulted in producing a curved electrotype plate which is practically perfect. These plates were used in printing the illustrated pages of the April *Century* on a new press, designed by Mr. Theo. L. De Vinne and built by Hoe & Co., in which a cylindrical bed is substituted in place of the ordinary flat bed. The plates and press in this case are a great triumph in printing invention, not only securing all the perfection of flat cylinder presses in printing, but more than eight times the output of the fastest of the flat presses heretofore used on the same work.

With the new processes of making a perfect curved electrotype plate, the web press, which embodies the perfection of mechanism, will come into general use. It is especially fitting that this great step in inventive skill and typographical art should be developed within the office and under the direction of that Nestor of the printing art, Mr. Theo. L. De Vinne.—*Albany Argus.*

Oxygenated Oil Gas.

This is a gas-making process invented by Mr. E. Tatham, of Balmain, New South Wales.

The richest cannel gas that can be commercially distributed is, according to Scotch experience, of not more than 30 candle power measured at the works. This gas, when burnt from a No. 1 or No. 0 union jet burner, is apt to smoke, and to clog the holes of the burner. Attempts have been made, chiefly in America, to sell 50 or 60 candle gas produced by retorting cheap petroleum oils and residuum; but the flame is too smoky to burn in air without a blast, which is unattainable. To dilute this gas with air is ruinous, and even when diluted with hydrogen and carbonic oxide, as in water-gas apparatus, the illuminating value is reduced in greater measure than the bulk is increased. Water gas, like "air" gas, is therefore only a device for letting down the high luminous power of oil gas to a manageable standard. Mr. Tatham's proposal is the direct contrary to this, inasmuch as he aims at rendering the richest oil gas not only manageable, but even superior in lighting power, by the addition of sufficient oxygen to insure its burning completely within the compass of an ordinary union jet flame.

The first step in the process now under notice is the production of the richest possible oil gas, which is done at the Westminster experimental station by subjecting petroleum to a not extreme heat in an iron retort. The result is the production from a gallon of oil of about 100 cubic feet of a mixture of hydrocarbon gases and vapors giving a nominal illuminating power of about 100 candles. By raising the heat, some of these vapors could, of course, be gasified, with an increase of 10 to 20 per cent of volume of the product; but at a loss of from 30 to 40 per cent of illuminating power. With the product as made, however, Dr. Thorne mixes 20 per cent of oxygen; and he states that, so far as his means enable him to determine, this addition prevents the condensation of the petroleum vapors, the presence of which contributes so greatly to the high illuminating power of the mixture. This mixture, when stored over water, seems to be practically permanent. It burns clearly and smokelessly from a No. 00 or No. 0 union-jet burner, or from a Pintsch's burner as used in lighting railway carriages. Its light then compares favorably on the photometer with that of ordinary London coal gas, burnt (under the same pressure) at the rate of 7 cubic feet per hour in a No. 6 burner of the same class. According to this test, the oxygenated oil gas is something over eleven times the value of the common coal gas. Of course, this comparison is only approximative; but it exhibits with sufficient clearness what the oxygen does for the oil gas, which otherwise would burn with too yellow and smoky a flame for use. If the proportion of oxygen is increased, the effect is to render the gas flame whiter—slightly at the expense of its illuminating power. If, therefore, some of the hydrocarbons were condensed out of the gas in storage or traveling through mains, so as to noticeably heighten the proportion of oxygen in the remainder, the effect would not be very detrimental. Dr. Thorne is assured that under no conditions could the condensation of hydrocarbons be so great as to leave the oxygen in excess, which it would require to be to constitute an explosive mixture in the mains and holder.

The commercial question remains to be considered. It is known, from the experience of railway companies with Pintsch's oil gas, that a gas of this kind can be made from petroleum at current prices for about 6s. per 1,000 feet. The cost, however, like that of the oxygen to be used with it, must largely depend upon circumstances. It would not be an extravagant estimate to price the mixture of 80 per cent of oil gas and 20 per cent of oxygen at 7s. 6d. per 1,000 cubic feet. Supposing, therefore, that some of the superior illuminating power of the mixture is treated as a "bonus," and not reckoned in the comparative value, it would appear that Mr. Tatham's gas ought to compare favorably with coal gas in most places. It is, of course, imprudent to attach conclusive value to mere laboratory trials and estimates in a matter of lighting; but here it at least appears that a *prima facie* case has been made out by Dr. Thorne for a working trial of the Tatham system under conditions that would remove the uncertainties left by the Westminster experiment. Credit is due to the proprietors of the system for their good faith in placing the preliminary tests of the invention in reputable hands. They do not attempt to make a secret of anything about their apparatus, which is indeed of the simplest character. There is no mystery about the elements which must go to make the success of the scheme, or condemn it, as the case may be. They lie on the surface; and if there is any doubt in the mind of a reader of this description respecting one or all of these points, it can be stated to, and will probably be removed by, Dr. Thorne, of the Brin's Oxygen Company, who has implicit confidence in the scientific basis of the invention.—*Jour. of Gas Lighting.*

© 1890 SCIENTIFIC AMERICAN, INC.

EDISON'S PHONOGRAPHIC DOLL.

The new "talking doll industry," established upon the basis of the Edison phonograph, has reached such proportions as to entitle it to more than a passing notice. At Orange, N. J., within a short walk of the world-renowned laboratory of Edison, are located a number of buildings occupying a ground space of many acres, in which over 500 people are engaged in the manufacture of the phonograph in its two principal forms, one of which is the commercial instrument repeatedly described in our columns, the other the phonographic doll, which we now present to our readers for the first time. This interesting toy forms an attractive object at the Exhibition of the Wonders of Electricity now in progress at the Lenox Lyceum, in this city.

As near as we can judge from a tour of the works, about one-half of the plant is devoted to the doll industry. Necessarily much of the mechanism of the doll is made in the regular phonograph works; but the adjustments, the manufacture of the record cylinders which determine the story which the doll shall tell, as well as the packing and shipping, are all conducted in an extensive building exclusively devoted to the manufacture of talking dolls.

The finished doll, shown in the upper left hand figure of our engraving, has the same appearance as other dolls; but its body is made of tin, and the interior thereof is filled with mechanism very much like that of the commercial phonograph, but of course much more simple and inexpensive. The cylinder of the phonograph of the talking doll is mounted on a sleeve which slides upon the shaft, the sleeve being screw-threaded so as to cause the cylinder to move lengthwise of the shaft. A key is provided by which the cylinder may be thrown out of engagement with the segmental nut, and a spiral spring is provided for returning the cylinder to the point of starting. The cylinder carries a ring of wax-like material, upon which is recorded the speech or song to be repeated by the doll. Upon the same shaft with the record cylinder there is a large pulley which carries a belt for driving the flywheel shaft at the lower part of the phonographic apparatus. The key is fitted to the main shaft, by which the phonographic cylinder is rotated, and the flywheel tends to maintain a uniform speed.

Above the record cylinder is arranged a diaphragm, such as is used in the regular phonograph, carrying a reproducing stylus, which is mounted on a lever in the same manner as the regular phonograph. The funnel at the top of the phonographic apparatus opens underneath the breast of the doll, which is perforated to permit the sound to escape. By the simple operation of turning the crank any child can make the doll say "Mary had a little lamb," "Jack and Jill," or whatever it was, so to speak, taught to say in the phonograph factory.

In passing through the works it is noticeable that order and system reign in every department. Everything is done upon the American, or "piece," system. The tools and machinery here used are the finest procurable. Every piece without regard to its size or importance is carefully inspected by aid of standard gauges, so that when the parts are brought together, no additional work is required to cause them to act properly.

The works of the doll are to some extent adjustable, and any adjustment necessary is effected in an extensive department in which the little phonographs are received from the assembling rooms. Here they receive the finishing touches, and are passed on to another room where they are placed in the bodies of the dolls. From this department the finished dolls pass on to the packing room, where they are carefully stored away in boxes having on their labels the name of the story the doll is able to repeat. This department is illustrated by the lower left hand figure of our engraving. The central figure shows the manner of preparing the wax-like records for the phonographic dolls. They are placed upon an instrument very much like an ordinary phonograph, and in the mouth of which a girl speaks the words to be repeated by the doll. A large number of these girls are continually doing this work. Each one has a stall to herself, and the jangle produced by a number of girls simultaneously repeating "Mary had a little lamb," "Jack and Jill," "Little Bo-peep," and other interesting stories is beyond description. These sounds united with the sounds of the phonographs themselves when reproducing the stories make a veritable pandemonium.

The manufacture of this interesting toy calls into requisition the skill of mechanics in almost every branch, and it has necessitated the construction of new tools which are interesting of themselves. Mr. Batchelor, engineer of the Edison laboratory and works, and Mr. English, manager of the phonograph works, are continually devising means for facilitating the manufacture of these interesting toys. The factory has at present a capacity for making about 500 talking dolls a day.

STOVE BLACKING.—2 parts copperas, 1 part bone-black, 1 part black lead, mixed to consistency of cream with water. Two applications are recommended.

The Massachusetts Charitable Mechanic Association.

The seventeenth triennial exhibition of industry, skill, and art of this association opens on the 1st of October this year, the exhibition continuing for two months. This organization is now almost a century old, and in its fine buildings and grounds, in the best part of Boston and extremely convenient of access by means of many railroads, as well as in the marked ability, financial strength, and broad-spirited management which has always characterized its Board of Control, is able to offer to inventors, artisans, and manufacturers the very best of facilities for bringing their ideas and productions before a large and especially wide-awake public. Intending exhibitors are particularly urged to be prompt in making their applications for space and explaining their plans to the management, who mean broadly to exhibit the processes of manufacture as well as the finished products, giving the public an opportunity of witnessing the operations employed in working wood, iron, brass, and other metals, glass, stone, clay, and other materials, as well as the manufacture of textile and other fabrics, by the operation of fine machinery and by skillful mechanics engaged in many branches of productive industry. There is no doubt that in so doing they will confer a lasting benefit upon the community, and especially upon the rising generation, who will here be able to witness the various mechanical operations involved in fabricating a multitude of articles of utility and luxury.

The Engine Wreck on the City of Paris.

A representative of the London *Engineer* visited the starboard engine room of the City of Paris after she was docked at Liverpool, and reports as follows:

"We examined the engine room carefully before anything had been removed. The result of our examination was to show that everything that could be broken had been broken; what could not be broken was bent, twisted, or distorted. Nothing so complete in the way of a breakdown has before been seen. The explosion of a great shell might work such havoc in an ironclad.

"Descending to the crank platform, crawling under and climbing over a heap of fragments, we find some curious things. The top cylinder cover seems to be at the bottom of everything. The A frames have apparently disappeared bodily. The connecting rod is still coupled to the crank pin. The big end is intact, but the rod, about fourteen inches in diameter in the middle, is bent. The piston rod and cross head are still coupled to the connecting rod and lie folded back along the tail rod, which is bent like a bit of wire nearly in a semicircle.

"One side of the condenser has been torn out. The tubes are all displaced, and a good many of them flattened. The air pump levers are literally rolled up like bits of ribbon. On the side of a part of the cylinder is a great crack, but the metal still holds together in a way to demonstrate toughness in no ordinary degree.

"But the ruin is not confined to the engine room. The great screw shaft, 21 inches in diameter and over 100 feet long, has been ripped up out of its bearings from one end of the screw tunnel to the other, and then dropped back again. All the cap bolts are smashed. A great rent is torn in the bulkhead. Where the shaft passed through it, the half inch steel plate has been bent and buckled like a bit of paper.

"The smashing of the condenser was followed by an enormous rush of water into the engine room. The condenser lies low in the ship, considerably under the water line. It was supplied by Gwynne's centrifugal pumps, drawing water through a copper pipe nearly two feet in diameter. The pumps and condenser were wrecked. The water, of course, rushed in like a cataract through the broken pipes. Two holes were made in the bulkhead between the engine rooms.

"The engineers did all they could to stop these holes, but they were ultimately driven out of the port engine room by the rising water. The screw shaft was ripped up out of its bearings from end to end. Then it dropped again, but in lifting it tore up the after bulkhead and left a large aperture through which the water rushed, filling the dynamo room and screw alley. Not a drop of water got into the boiler room. The rush of steam into the engine room was for the moment tremendous, but the engineers dashed into the engine room and screwed down the stop valve with commendable courage and promptitude.

"As to the cause of the accident, experts are satisfied that something in the engine did not give way first, but that the sequence of events was as follows:

"The brass liner on the tailshaft burst.

"Then the lignum-vitæ strips were torn out, bringing metal to metal.

"Then the tailshaft ground away the liner in the stern bracket.

"Then the steel shaft ground away itself, and the bracket and shaft dropped.

"Then the continual bending action which took place resulted in the shaft breaking just where it came out of the steam tube."

Correspondence.

Increasing Weight on Locomotive Drivers.

To the Editor of the Scientific American:

I have no doubt that many of your readers would be interested, and perhaps instructed, if you were to explain how the "device for increasing weight on drivers" (on first page of March 8 number) can produce such an increase. J. BURKITT WEBB.

Hoboken, N. J., April 7, 1890.

[The matter, we thought, was clearly illustrated and explained. Perhaps our correspondent will suggest wherein he finds the explanation obscure.—EDS.]

The Preparation of Oxygen.—Aluminum Negative Plates for Batteries.

To the Editor of the Scientific American:

Recent numbers of the SCIENTIFIC AMERICAN have contained several paragraphs in regard to the mode of preparing oxygen. For several years past, acting upon the suggestion of a friend, I have discarded the use of the oxide of manganese entirely, and have substituted for it the carbonate of iron, mixing it with the chlorate of potash in the same proportion in which I formerly used the oxide of manganese. I think I can safely say that when the carbonate of iron is used, there is no danger of explosion from impurity of materials.

I have also found that when oxide of manganese is used, the residuum in the retort, after the first operation, pulverized and mixed with the chlorate, is better than the manganese itself. I state only the results of my own experience.

In your article of March 15 upon the manufacture and uses of aluminum, it is stated that this metal is relatively about thirty-two times as cheap as silver; that as a conductor of electricity it equals silver; and that it resists all acids except hydrochloric. Now, as I have not at present the means at hand to determine for myself by experiment, I will inquire if aluminum strips or plates might not be advantageously substituted for platinum or carbon in the Grove or Bunsen battery, when either nitric acid or the bichromate solution is used? J. A. BADGER.

Delavan, Wis.

[We should be glad to have the opinions of any of our readers as to the points suggested in this communication.—ED.]

Butterflies at High Altitudes.

To the Editor of the Scientific American:

I have just read in an Eastern magazine an article on butterflies, wherein it is stated, as a fact rather remarkable, that among the Alps butterflies have been seen at altitudes as great as 8,000 feet. I have on two occasions seen them at heights considerably greater than 8,000 feet, but I did not then know that there was anything remarkable about it.

Last summer, while on a peak of the Sierra Nevada mountains, at an altitude of 13,000 feet, I saw butterflies sailing leisurely about in the air above me, with no more ado than if it had been a lowland garden. That was above the line of perpetual snow. In climbing that peak I had passed over snow 10 feet deep, and the crags around me were covered with ice and sleet. The sun shone clear, yet the air was cold.

At another time, in the summer of 1887, I saw butterflies at an altitude of 11,000 feet, on a mountain of British Columbia, near the southeastern frontier of Alaska. There was a pass, although a high one, in the mountain, and the butterflies were going through it toward the East, and seemed to be migrating. Although these were not so high as those seen on the Sierra Nevadas, yet in a latitude so far north it was more surprising to see them—practically almost under the arctic circle. The butterflies were several thousand feet above the line of perpetual snow. As I said, they seemed to be crossing the mountain, all going in the same direction. Those on the Sierra Nevadas, on the other hand, appeared to be flying about for their own pleasure, not going anywhere in particular.

HU MAXWELL.

Toll House, California.

An Electric Light Costume.

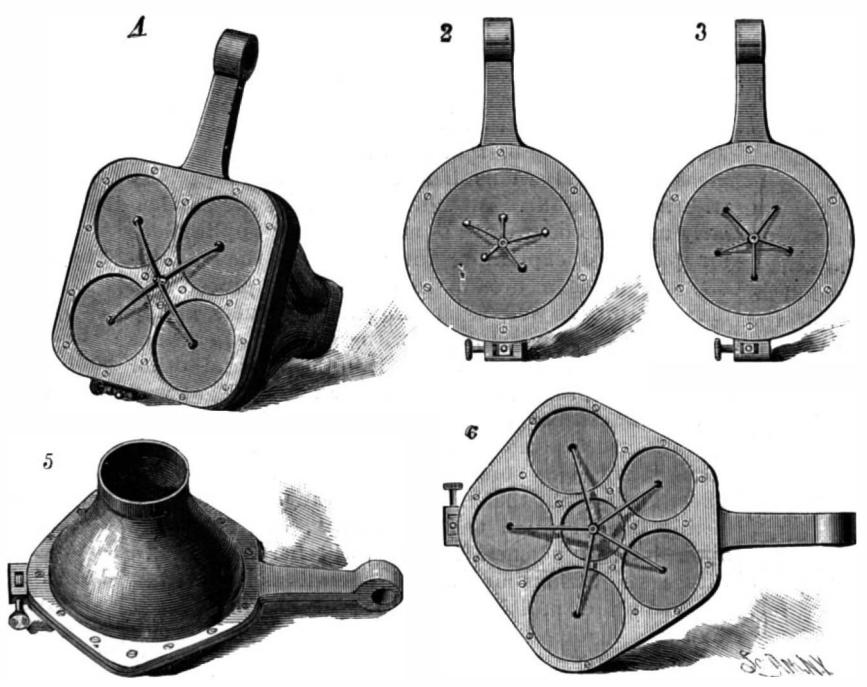
A great event in the history of Brookings, South Dakota, according to the local papers, was the Merchants' Carnival, which took place in that city a few nights ago. During the course of the festivities at the opera house every industrial enterprise in the thriving town was illustrated by a lady dressed in an appropriate costume representing some distinct feature of the industry. The representative of the electric light company was Mrs. E. E. Gaylord, wife of the manager and electrician of the Brookings Electric Light Company. Mrs. Gaylord wore a crown of incandescent lamps, and her dress was decorated with the same ornaments. The lamps were all properly connected, the wires terminating in the heels of the shoes. On the floor of the stage were two small copper plates, connected to a small dynamo. When Mrs. Gaylord reached the plates, the 21 lamps of her crown, banner, and costume instantly flashed up.

© 1890 SCIENTIFIC AMERICAN, INC.

LIEUT. BETTINI'S NEW MICRO-GRAPHOPHONE.

Any reader of the daily papers must have noticed within the last few months frequent mention of a new instrument of the phonograph type, invented by Lieut. Gianni Bettini, an officer in the Italian navy, at present residing in this country. This gentleman conceived the idea of constructing a phonograph so as to be exceedingly sensitive to the different qualities of the tones of the human voice, and to reproduce those tones with the original qualities, so that the voice of the speaker could be easily recognized; and furthermore to produce uniformly good records without regard to the quality of the speaker's voice, also to secure a volume of sound which would compare favorably with that of a voice engaged in ordinary conversation, so that the words could be heard and understood without the necessity of employing stethoscopic ear tubes.

Every student of acoustics knows that vibrating membranes, strings, rods, columns of air, and thin plates of various kinds have active points and neutral points, and Lieut. Bettini has taken advantage of this fact in the construction of his instrument. He connects his recording stylus with the diaphragm at various points, to insure contact with one or more of the actively vibrating parts or ventres of the diaphragm, thus avoiding the points of rest or nodes where little or no vibration occurs.



VARIOUS DIAPHRAGMS USED IN BETTINI'S MICRO-GRAPHOPHONE.

This instrument, which has been named the micro-graphophone, is shown in perspective in the larger engraving, together with some of the accessories. The instrument proper is mounted upon the top of a case which contains an electric motor. In the frame of the instrument is journaled a shaft, which is screw-threaded upon one end and passes through a shear nut. Upon this shaft is mounted a metallic cylinder for receiving the record cylinder. The shaft is also provided with a pulley which receives motion from the electric motor in the base, through the medium of the belt. Upon a standard at the back of the record cylinder is mounted an angled arm which carries two sets of diaphragms, one for producing the record, the other for the reproduction of the speech. In the instrument as represented, the reproducing apparatus is in the position of use. The standard in front of the record cylinder is provided with vertical and lateral adjustments for causing the stylus of the reproducing apparatus to register with the record on the cylinder. The diaphragm cell, which is swung back out of the way, is the one employed for producing the record, and when so used it is swung into the position now occupied by the reproducing apparatus, and the flexible tube shown lying upon the table is used in connection with the cell.

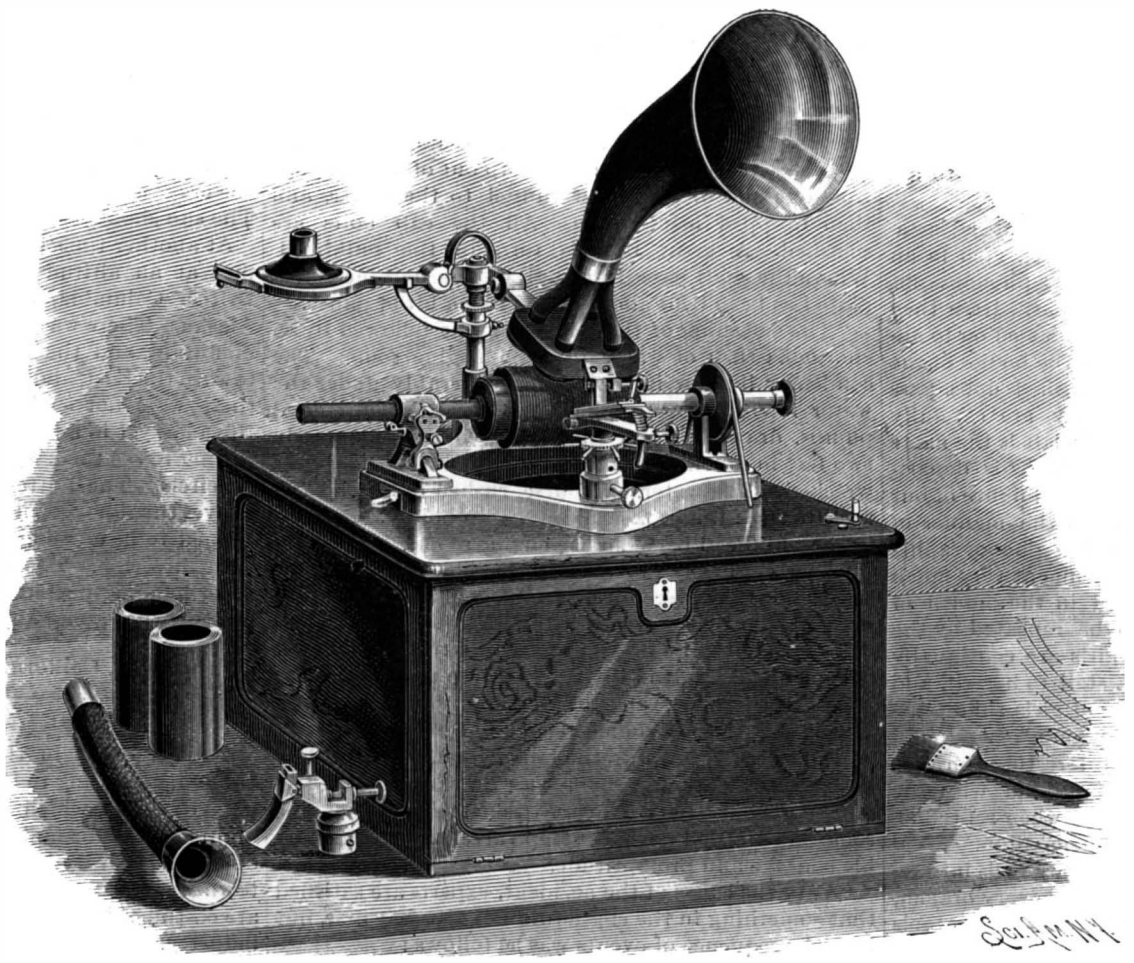
At the side of the motor casing which supports the micro-graphophone are shown two record cylinders and a tool for turning off these cylinders. This tool takes the place of the adjusting apparatus on the standard at the front of the machine. In Figs. 1 to 5, inclusive, are shown various forms of diaphragm cells and diaphragms employed in connection with the rotating and adjusting apparatus of this instrument.

To the diaphragm, shown in Fig. 2, is attached a spider, having arms of different lengths attached to the vibrating parts of the diaphragm. These arms are inclined outwardly toward a point opposite the center of the diaphragm, at which point they are all secured to the recording stylus. This construction, as the record shows, has considerable advantage over that in which the stylus is attached directly to the center of the diaphragm.

In Fig. 3 is shown a reproducing diaphragm in the simplest form. In this case a spider having equal arms is attached to the under surface of the diaphragm, with its arms arranged on a circle concentric with that of the periphery of the diaphragm. These arms are inclined outwardly, and joined at the center to the reproducing stylus. The effect of this construction is to secure a greater amplitude of vibration in the diaphragm, and to reproduce faithfully all of the overtones which are so necessary to reproduce the exact quality or timbre of the sounds originally uttered into the recording apparatus.

A similar idea in a modified form is shown in Figs. 1 and 5, in which a number of diaphragms are used in the reproducing apparatus. These diaphragms are of different sizes, or of different tension, or both, so that they will respond to a greater range of sounds. The small diaphragms are connected by arms to a central reproducing stylus. Each diaphragm has its particular range of sounds, while all are more or less affected by the same sound. As a consequence of this arrangement, Lieut. Bettini is enabled to produce a great volume of sound without destroying its timbre or peculiar quality. This instrument can be heard distinctly and understood in any part of an ordinary room. The instrument is equally susceptible to musical sounds, and singing, instrumental music, and whistling are brought out in a very satisfactory manner.

These sketches were made at Lieut. Gianni Bettini's laboratory at 110 Fifth Avenue, New York City.



LIEUT BETTINI'S NEW MICRO-GRAPHOPHONE.

THE Duc de Montpensier, who died the other day, left a fortune estimated at twenty million dollars. In accordance with the custom of King Louis Philippe, who insisted upon all his children learning a trade, the Duc de Montpensier, the *Pall Mall Budget* says, chose bootmaking, and up to the last made his own boots and slippers. He was a crack sportsman and horseman.

The Difficulty of Operating Railroads in Mexico and China.

When railways were first introduced in the interior of Mexico, it is related, says the *Mexican Financier*, that certain ignorant people avowed the belief that in the interior of the powerful locomotives were concealed enormous and fierce devils who devoured fire and emitted smoke and hissing steam. But while here only a few densely ignorant peons entertained so extravagant a belief, in China the vast majority of the population hold opinions which have, so far, proved an insurmountable obstacle to the acceptance of European civilization. When the Shanghai railway was built, the priests informed the people that the rumbling noise of the cars and the steam engine was distasteful to the dead who were buried along its course. To appease the wrath of the dead, Chinese capitalists bought the road with its equipments, tore up the tracks, and stored the entire plant under sheds at Shanghai. The Taouist religion stands in the way of all innovations in China, and the first thing necessary to introduce railroads is to dethrone the priests. Through the influence of Li Hung Chang, the Emperor was prevailed upon to grant the construction of a railroad from Hankow to Pekin. Shortly afterward the Temple of Heaven was burned in Pekin, and the terrible inundation came, which were interpreted to have been indications of disapproval of the proposed innovation on the part of the Taouist devil. So the Emperor revoked his sanction of the proposed railroad. The Chinese pantheistic theory of evolution is expressed in the assertion that "there is a god to every eight feet of space," and this theory offers serious hindrance to the utilization of metals, the opening of mines, and the building of railroads, and has prevented the Chinese availing themselves of the vast mineral resources of their country and from a full use of the products of the earth. This is the chief reason why the emigration of hundreds of thousands of Chinese has become necessary. A Chinese teacher writes: "If the people were unhampered by fear of the invisible ones, who are considered by all to be the real proprietors of the land, they would have an abundance of lucrative work within their own borders, and need not afflict other countries with their immigration." Recent tourists in China announce that the Chinese statesmen of the Li Hung Chang stamp have entirely risen above this superstition, and that the Chinese merchants speak contemptuously of the efforts of the priests to prevent the calamity of the floods, saying, "Chinaman, he all time chin, chin" (meaning that they resort to prayers and other priestly methods in time of calamity), "while Melican man he build more stout walls to keep water back."

Double Turrets.

Ericsson declared most unmistakably that two turrets on a vessel had "the same advantages as two heads on the human body or two suns in the heavens." There are advantages in either case, but the disadvantages are innumerable. "The proposition is incontrovertible," he further said, "that when all the resources of mechanic art have been employed, on either side, the nation that puts a fleet of double turret ships to sea will be utterly annihilated by the nation that employs the single turret ship, with its greater speed, greater impregnability, and heavier ordnance. This concentration gives a thickness to the turret, insuring absolute impregnability, guns of such caliber as to crush an adversary at a single blow." At the same time Ericsson believed that the day for heavy ironclads of all sorts had passed. The type of naval structure he advocated was a light vessel of high speed, carrying a single gun, planting its shots under water and below the cuirass of armored vessel, and he believed in a contact so close that no shot could be misdirected.—*Army and Navy Journal.*

© 1890 SCIENTIFIC AMERICAN, INC.

THE STEPPED PLATFORM RAILWAY.

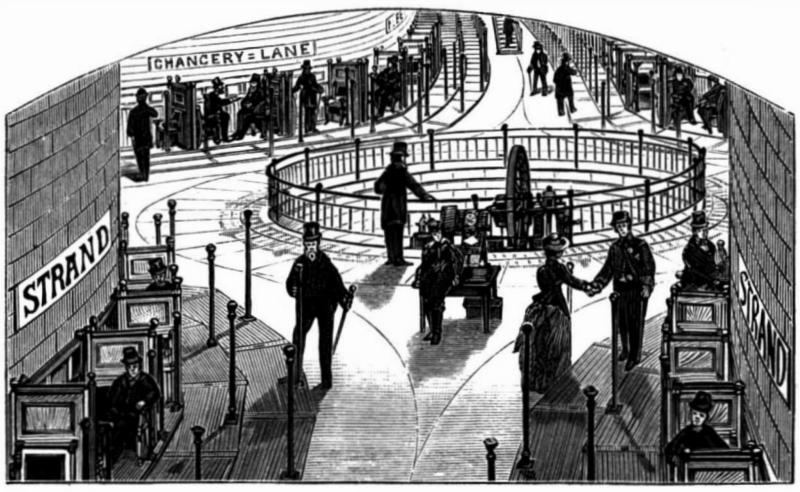
About twenty years ago Mr. Alfred Speer, Passaic, N. J., projected a system for city transit which consisted of what might be termed a movable pavement. He proposed to have a series of endless belts arranged side by side, but moving at different rates of speed. These belts were to be made up of a series of small platform railway cars strung together. The first line of belts was to run at a slow velocity, say three miles per hour, and upon this slow belt or moving pavement passengers were expected to step without difficulty. The next adjoining belt was intended to have a velocity of six miles per hour; but its speed, in reference to the first belt, would be only three miles per hour. Each separate line of belt was thus to have a different speed from the adjacent one; and thus the passenger might, by stepping from one platform to another, increase or diminish his rate of transit at will. Seats were to be placed at convenient points on the traveling platforms. Mr. Speer's invention was duly patented in this country in 1871, and on April 20, 1872, it was fully illustrated in the SCIENTIFIC AMERICAN. The project attracted much attention at that time.

Mr. Speer constructed a large working model, which operated with complete success, and was examined by thousands of people. But all the efforts of the inventor to interest capitalists to build the novel railway proved unavailing, and the patent has expired. This peculiar system of travel has lately been revived in Germany, from whence it now comes to us, under the auspices of Messrs. Wilhelm and Heinrich Rettig, by whom it has been repatented in that country. We have received from them a handsome pamphlet, containing drawings, details, and calculations relating to the project as worked out by them. The completeness of their presentation of the subject is very noticeable. We give herewith a few illustrations of their project, which they designate as "the stepped platform railway."

One of the engravings is a diagram showing a passenger in the act of passing from one platform to another. The large cut shows a street scene with the railway elevated on posts. The voyager steps from one movable platform to the other, and reaches the seats. Some of these are to be covered or inclosed, while others are simply open air chairs.

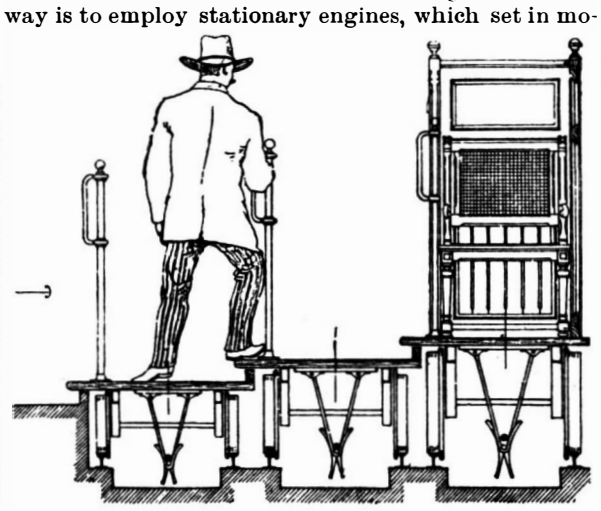
The authors say their arrangement admits of establishing a network of lines well connected in all their parts, in the business center of a large city. Independent lines or circles built as straight lines can branch off to the outskirts of a town. The lines laid in the center of the town can be constructed with two or three rings of stepped rolling platforms. Those which are laid in the outskirts of the town may only have one running platform for the purpose of reducing the costs of the plant, working expenses, and the speed to the lowest extent consistent with the requirements of the traffic. For the same reasons, the entrances to and exits from the line would be close together in the crowded parts of the town, but further apart in other parts where the traffic would not be so great. The arrangement of the junction of four circuits is such that a passenger leaving one line shall get free and unhindered access to any of the three others.

Places of junction should be sufficiently spacious to allow of erecting there stationary engines supplying the motive power necessary to work the line.



THE STEPPED PLATFORM RAILWAY.

The most suitable manner of working such a railway is to employ stationary engines, which set in motion cables or chains made of suitable links, to which the sets of carriages are attached.



TRANSVERSE SECTION SHOWING RELATION OF MOVING PLATFORMS.

Although it may be true that the motive power required by the running of empty trains in this system of railways is much higher than that of an urban railway, yet, with an hourly dispatch of 1,800 passengers, the motive power is but a small percentage higher than that of a railway. This result is due to the fact that the cars of the stepped platform railway can be made very light, that the weight of the driving engines has not to be moved, that the respective speeds of both the platforms and trains are much less than those of railway trains, and more especially because the mass once set in motion has not to be stopped and put into motion again.

But if the traffic increases, the present system shows extraordinarily advantageous results over railways. With a traffic of 12,000 passengers per hour, the motive power does not even exceed one-fourth of that required by the working of a railway.

To produce the same result, a railroad would be obliged to dispatch 30 trains with 8 cars each in one hour. That such a traffic can occur in fact is proved by the principal lines of the London Railway Companies, which between Farringdon and Moorgate Street stations run on four lines of rail 586 trains in one day.

The stepped platform railway will be very safe. Chances of accidents are limited. The fall of a person passing from one platform to another would not be attended with serious results, as the difference between the speed of two platforms is equal to the average speed of a pedestrian.

The advantages of the improved system are summed up as follows by the authors:

The plant requires little room, as its width and height are not great.

The construction of the substructure is incomparably cheaper, as it will have to support only the fifteenth part of the load which an ordinary locomotive railway would have to support.

Owing to the facility with which the trains travel round sharp curves, the railway can follow the direction of the streets, and there are, in consequence, no heavy expenses for the acquisition of land.

The stepped platform railway will be used more extensively than any other means of transport. The running power required for a heavy traffic is very low, and renders it possible to convey passengers at reduced fares.

The number of employes can be very small.

The system of railway is always capable of enlargement. It affords a means of quickest dispatch.

There is neither smoke nor dirt.

No getting in or out of the cars in the middle of the traffic of a street.

The passengers can move about without hindrance. Each one has his own seat. There is no crowding at the stations or of the compartments.

No time table, no late arrival.

No waiting for trains.

THE STEPPED PLATFORM RAILWAY.

© 1890 SCIENTIFIC AMERICAN, INC.

No inquiry about certain lines, as the passenger is always traveling on a system well connected in its whole, and any error can always be made good, as the passenger can always change trains at once.

No danger, no complicated signals.

Little noise, owing to the reduction of the weights moved and to the low rate at which they travel.

THE NEW GUN OF THE GERMAN ARMY.

Hardly has an apparatus been obtained that surpasses all the preceding ones, than a new invention is brought out, with improvements. That is evidently the law of progress, but when it is a question of arms of war, it will be readily conceived that this sort of progress imposes a perpetual *qui vive* upon those who have in hand the honor and independence of nations.

Not long ago, France, with the Lebel gun, was in possession of the most improved and the surest weapon that existed in Europe. When we speak of the Lebel gun, we wish to speak at the same time of its ball, and especially of the powder called smokeless, the indispensable complements of the weapon. We shall return to this question, however, in speaking of the new German gun which we are to describe.

Germany, in fact, could not remain in a state of inferiority in so important a question, and as soon as she had become acquainted with the wonderful results obtained in France with the Lebel gun, she set herself to study an arm that might be successfully opposed to it.

The new gun, called the "Model of 1888," is a weapon that differs little from the Mauser of 1871–84, save that its closing has been rendered symmetrical by two tenons placed on each side, in front of the closing cylinder, and which at the moment the gun is fired place themselves in two recesses formed in front of the breech box.

The chief differences existing between the new and the preceding model relate principally to the reduction of the caliber and the mode of loading, which, instead of being done through a magazine, as in the Lebel, is done through loading boxes, as in the Mannlicher, but in a little different manner. The cartridges of the new gun are united, in fact, by packages of five in a loading box, G, the sides of which are formed of very thin embossed sheet iron, and which fits in a chamber formed in the breech box with as much ease as a single cartridge would.

The cartridge itself forms an innovation upon all others that now exist. Thus, as may be seen from figures F, G, H, I, it has no projecting rim at the base, but, on the contrary, it has a small groove, in order to allow it to be grasped by the extractor that removes it after the gun has been fired. The cartridge is filled with smokeless powder, which, it appears, gives results analogous to those obtained in France. The ball, which is of hardened lead, is incased in German silver.

Our engraving also shows the blank cartridge carrying a hollow wooden ball, and the cartridge for practice, the hollow ball of which is of brass.

The equipment of the German infantryman consists of three cartridge boxes provided, altogether, with 150 cartridges, which weigh 11 lb. Moreover, a supply of cartridges calculated at the rate of 100 per man is carried by wagons which constantly accompany the troops, and go on to the field of battle during the fight. The gun, when empty, weighs 8·3 lb., say about 12 oz. less than the Lebel.

The barrel of the gun is surrounded throughout its entire length by a steel plate jacket, which preserves it from shocks, and at the same time protects the hand of the soldier and the stock of the gun against the heat due to rapid firing.

The gun is maneuvered very easily. After the loading box has been put in place, the elevator, V, thrusts the cartridges upward, the highest of which enter the chamber, and so on until the supply is exhausted. When the loading box is empty it falls to the ground through its own weight, without there being any necessity of extracting it, and, as it has no value, it is unnecessary to pick it up.

In order to understand this apparently paradoxical fact of the box falling by its own weight when it is *empty*, it suffices to examine the engraving giving a rear view of the box. It will be remarked that the latter is sufficiently tight at the top and bottom to keep cartridges from escaping, but not enough to prevent the finger, V, of the elevator from passing freely. So long as any cartridges remain in the box, the latter is held by the top cartridge, and when, finally, the last cartridge is withdrawn, the box falls, as it is no longer arrested by the finger of the elevator, which allows it to pass freely.

The weapon is provided with a shoulder strap, E, fixed on one side, at *n*, in front of the magazine, or at *p* for marches. On the other side it is fixed at *r*. From a ballistic point of view, the new gun has remarkable results, sensibly equal to those given by the Lebel.

The inital velocity is 2,033 feet, and the maximum range 9,185 feet. Yet the breech sight is regulated up to 6,725 feet only.

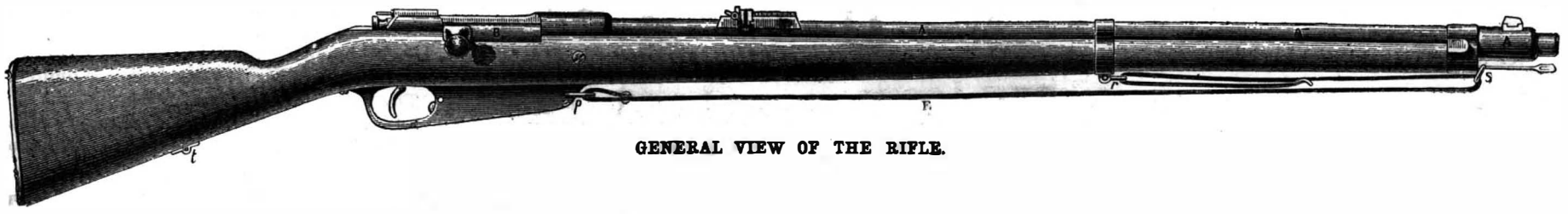
At a hundred yards the ball pierces 32 inches of fir and 36 inches of sand; at two hundred yards, 17 inches of fir and 20 of sand; finally, at eighteen hundred yards it still traverses 2 inches of fir.

It is well, however, to make sure of the constancy of such results. As regards the ballistic properties of a weapon, it is the powder especially that is the great factor, and up to the present France alone has succeeded in obtaining in practice pyroxite powders uniform in their results. The great drawback with all such powders, that which has most interfered with their use, has been their extreme sensitiveness to atmospheric influences.

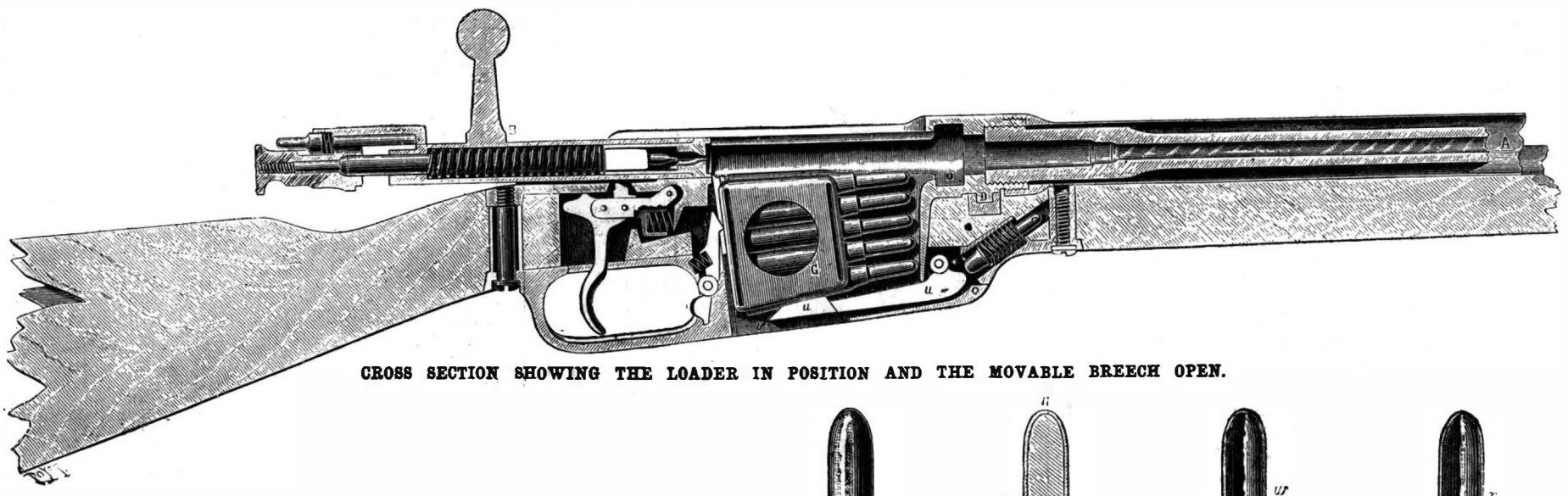
The German gun differs from the Lebel as regards principle, in that it is a weapon with a loader, while ours is a gun with a magazine. Is the former preferable to the latter? That is a question that is not absolutely solved. At all events, the Germans answer in the affirmative, since their repeating rifle was a magazine gun, and they have just adopted the loader for the new weapon. We know, moreover, that in France even there has been a show of opinion favorable to the loader, and that several systems are under study, and it is very probable that this principle will finally prevail in our government.

The great inconvenience of the magazine, in fact, is that it is relatively difficult to load under fire, and when empty, it is easier to fire with single cartridges than to fill the reservoir. The loading box, on the contrary, which contains five balls, fits in the cartridge box, and is placed in the gun just as easily as one would maneuver a single cartridge, and this maneuver is always possible under the severest fire.

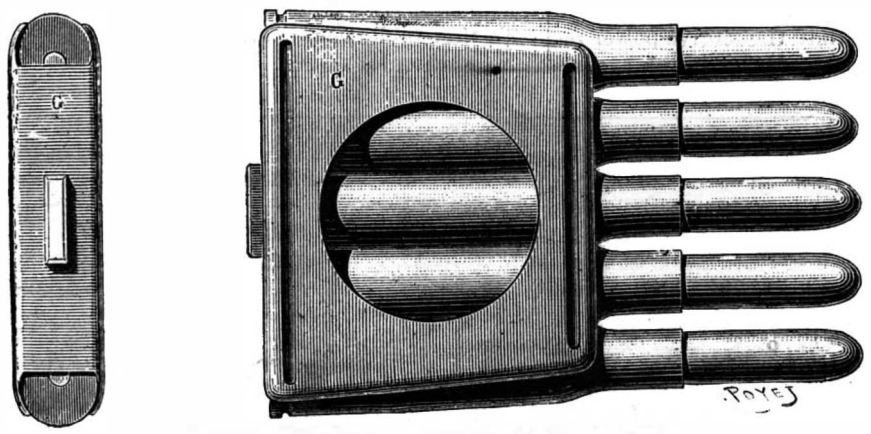
It may be concluded from this that the gun with a loader *always* maneuvers as a repeating weapon, while the magazine gun often ceases to be so in practice when the magazine is empty.—*L'Illustration.*



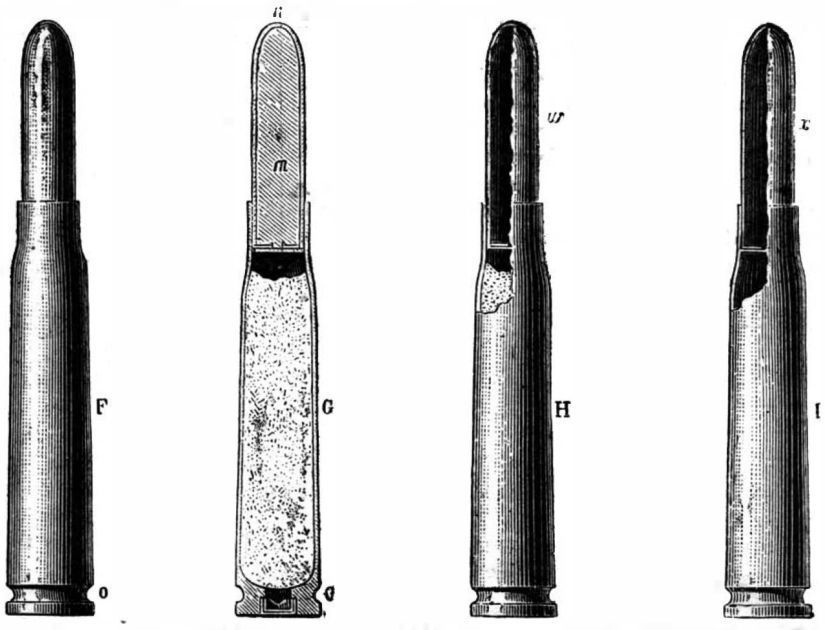
GENERAL VIEW OF THE RIFLE.



CROSS SECTION SHOWING THE LOADER IN POSITION AND THE MOVABLE BREECH OPEN.



REAR AND SIDE VIEW OF THE LOADER.



WAR CARTRIDGE. (Lead ball coated with German Silver.)

BLANK CARTRIDGE. (Hollow wooden ball.)

PRACTICE CARTRIDGE. (Hollow brass cartridge.)

NEW RIFLE RECENTLY ADOPTED BY THE GERMAN ARMY—MODEL OF 1888.

BARON LIEBIG, the great German chemist, says that "as much flour as can lie on the point of a table knife contains as much nutritive constituents as eight pints of the best and most nutritious beer that is made."

© 1890 SCIENTIFIC AMERICAN, INC.

The Cheapest Light.

At the session of the National Academy of Sciences in Washington, April 17, Professor Langley read a paper "On the Cheapest Light." In all artificial lights, he said, there is an enormous waste of energy. Thus in heating a poker to incandescence at least fifteen-sixteenths of the amount of coal burned is required to raise the temperature sufficiently to emit light. It is as if we had to strike all the low notes of a piano before we could sound an upper one. If while using such an instrument we should hear the singing of a bird, we should realize that Nature had provided a far simpler apparatus.

We find an analogous case in the simplicity and economy of natural compared with artificial methods of producing light. The paper gives an account of observation on a firefly—*Pyrophorus noctilucus*—many specimens of which were secured from the West Indies, and the spectrum of light emitted by them was studied with the aid of the spectroscope, while the heat emitted was measured by Langley's bolometer.

The spectrum from light of this insect is very short, extending only from F to C and culminating in green, so that the heat rays are entirely absent, not heat enough being emitted to raise the temperature of the bolometer 1-200,000 of a degree Centigrade in ten seconds' exposure.

That the absence of heat rays is not caused by the faintness of the light is shown by comparing it with light from a candle reduced to the same amount, which is accompanied by two or three hundred times as much heat.

In all ordinary methods of illumination there is a loss of at least one hundred, probably several hundred times as much heat as is utilized, most of the energy being consumed in raising the temperature of flame to at least two thousand degrees.

The light of the firefly is not a vital, but a chemical process, in other words combustion, as is proved by the fact that nitrogen quenches and oxygen enhances it, and that it is attended by the production of carbon dioxide; though as respects heat it is even more economical than sunlight. It seems that chemistry should find means to imitate this process, giving us a form of combustion wherein the energy of fuel is all converted into light instead of being mostly wasted in heat.

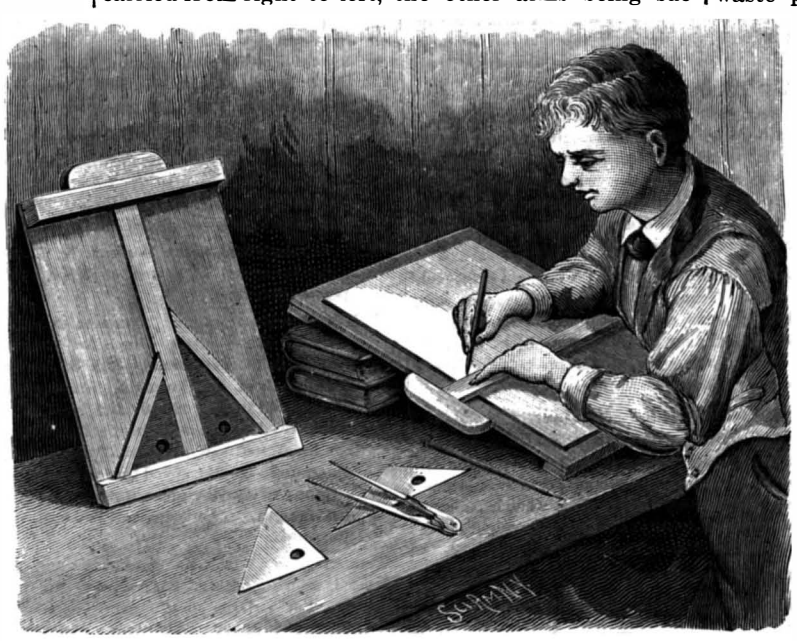
A Problem Defying Solution.

Boston *Herald* produces the following problem which is worth considering. Assuming that a community of 100,000 workers can produce in a day, by the labor of ten hours, wealth to the value of $300,000, then if their labor is cut down to eight hours a day, they must either work harder or more skillfully in the shorter period, or there will be one-fifth less of wealth to divide among those interested in its production. There is no way of getting over this. At the present time the wages earned are paid, and the capitalist receives his returns from the gross sum of production. If this sum is cut down in any way, a loss is inevitable either on the side of the capitalist or wage earner, or on both sides. While $5 divided among five men will give each $1 apiece, there is no process of arithmetic by which $4 divided among five men will produce the same result.

AN IMPROVED DRAWING KIT.

A neat form of drawing board, provided with a T-square and two triangles, and well known as the Springfield Industrial Drawing Kit, is shown in the accompanying illustration. It is intended for use in grammar and high schools, the family, the office, andthe shop.

The pads used with this board are preferably slightly glued to the board at the corners, the sheets being torn off one by one as fast as they are used. The T-square is a substantial instrument, and its head is adapted for use with the pad as well as the single sheet, being thick enough to allow it to have a hold on the board when the pad is of full thickness. The two triangles include all the angles ordinarily needed. For convenience in keeping the several pieces of the set together, as shown in one of the figures in the illustration, the back of the board has grooved cleats, and the cross cleats are slotted to receive the tongue of the T-square, so that when all the pieces are in place they are securely locked together. This kit is manufactured by the Milton Bradley Company, of Springfield, Mass., and perhaps its most noticeable feature is that a set of such excellent and serviceable devices can be furnished at the low cost at which this kit is afforded. It is not, therefore, surprising that it has been so largely adopted in the furnishing of school supplies.

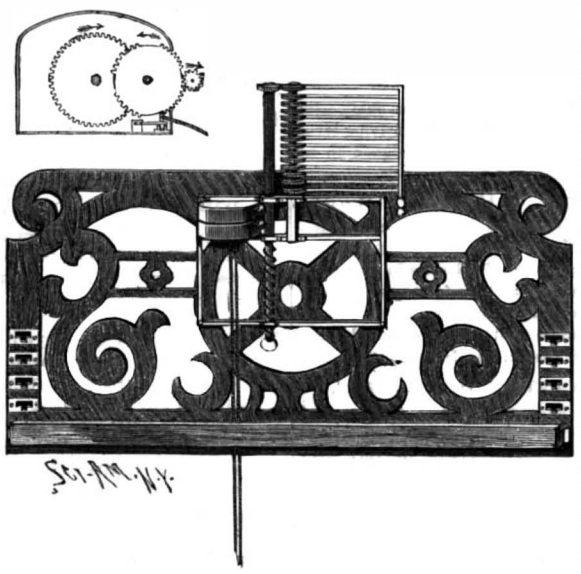


THE SPRINGFIELD INDUSTRIAL DRAWING KIT.

FILES can, it is said, be recut by cleaning them in acidulated water between two plates of carbon and closing the circuit so as to form a real voltaic cell.

AN IMPROVED MUSIC LEAF TURNER.

The device represented in the accompanying illustration is designed to be automatic in its action and to be capable of turning a large number of leaves, either of bound or sheet music, without liability of the sheets falling upon the keys. It has been patented by Mr. Morison Kyle, of Rat Portage, Ontario, Canada. The body of the device consists of a rectangular frame screwed to the usual fretwork music rest, there being vertically journaled in this frame a revoluble shaft, the upper portion of this shaft being longitudinally



KYLE'S LEAF TURNER.

toothed, while its lower portion has a quick-feeding thread and terminates in a handle. To the left of this shaft are fixed two drums, independent of each other, each of the drums having a train of gearing, as shown in horizontal section in the small view, in which a spring-actuated spur wheel is made to mesh with a pinion on a shaft carrying a mutilated gear, the teeth of which are arranged in spaced segments. Below the mutilated gear is pivoted a stop lever, one end of which is normally held in contact with the gear by a spring, a cord leading down from the other end of the lever to a treadle. The several mutilated gear mesh with the longitudinally-toothed section of the vertical shaft, on the upper end of which a gear is rigidly attached. The mechanism of one drum has a reverse movement to that of the other. At the right of the main vertical shaft a parallel shaft is detachably inserted in a sleeve or socket, this latter shaft having a series of segmental gears loosely mounted and adapted for engagement with the gear rigidly attached to the upper end of the main shaft. From each of the segmental gears on this parallel shaft a horizontal arm is projected, which is curved downward at its outer extremity and terminates in a clip, the several arms being thereby attached to respective music sheets. These arms are arranged to fold together, so that when all the arms are folded back, the vertical section of the upper arm only will be visible from the front. The several arms having been attached to the music sheets, the train of gearing in one drum is set in motion by means of the foot or knee treadle, and the upper arm is thus carried from right to left, the other arms being successively carried over in like manner. The music is turned back by similarly setting in motion the gearing of the other drum. In each side of the fretwork rest are secured plates, each having a T-shaped recess, in which the ends of the rest bar at the bottom may be entered, whereby the latter may be raised or lowered according to the size of the music.

The Kangaroo and the Buffalo in Australia.

Australia is likely before many years to have no kangaroos except in its museums. From the reports of the various stock inspectors, it was estimated that in 1887 there were 1,881,000 kangaroos, but in 1888 this number fell to 1,170,000. The chief objection to the adoption of measures for the effectual protection of the marsupial is his vigorous appetite. One kangaroo is said to consume as much grass as six sheep, a fact to which sheep farmers are painfully alive. It is curious to learn, however, that if the kangaroo is likely to be exterminated, a new introduction, the wild buffalo, has found a home in the plains of Northern Australia, where it is now to be met with in vast herds. These animals, which are said to be of extraordinary size, and to possess splendid horns, are, apparently, the descendants of the first buffaloes which were landed at Port Essington, in North Australia, about the year 1829.

Damage to Adjoining Structures from Heavy Buildings.

With the increasing size and weight of modern office buildings there come not only serious problems of safe and economical construction, but the still more difficult question of how to prevent damage to adjoining structures, not merely from undermining of foundations, which can be avoided by suitable underpinning, but from the actual compression of the soil.

If any one will take the trouble to examine the old and comparatively light buildings alongside of which some high and heavy structure has recently been erected, the chances are that he will find the old buildings more or less damaged by their new neighbor, and cracked walls and sills, and especially cracked lintels over the nearest windows, will show that the old wall next the more recent structure has been carried bodily downward. As before intimated, this settlement in most cases is not caused by any defect in, or injury to, the foundation of the old building, but by the fact that the heavier structure has compressed the soil and taken the lighter one down with it.

As the evil is progressive, increasing as the new building goes on, and for some time after it is finished, it cannot be provided against once for all, but the remedy must be progressive also, and the only way to prevent the injury is to keep the old wall wedged or screwed up while the new one goes down. The only instance we know of where this has been done is in the case of a large building in Chicago, where the soil is so compressible that such a building is expected to settle three or four inches during construction, and where one fine tall building has had one corner carried down four or five inches by a heavier building alongside, with the result of very badly cracking the older structure from top to bottom through the nearest line of windows. To avoid such a disaster the wall of the old building, some seven stories high, next which the new building just mentioned is being put up, is temporarily supported on screws, and is by them kept slightly above its normal position, so as to allow for settlement between times. These screws will support the old wall for some six months after the building is finished, and until all settlement is completed.—*The Engineering and Building Record.*

Battery Lighting.

Electric lighting by means of batteries is, says the *Electrical Engineer*, an ever-fascinating subject for inventors, and the pet scheme is to be able to sell the waste products, and so have the light for next to nothing. There is another of these schemes, this time hailing from France, which has the claim of a certain amount of originality. This is a single-fluid battery introduced by M. Pollak. It has no porous pot, and contains a plate of zinc as negative electrode, and a plate of lead as positive, with a solution of sulphate of copper as exciting liquid. The zinc is dissolved and the copper is deposited on the lead, the latter remaining inactive. The electrodes of the standard types are made to last for a fortnight, but the maker takes them back in exchange for new ones, the copper paying for the zinc, so that the sulphate of copper is the only expense. Every day a few crystals of sulphate are placed in a trough above the battery, and the water is regulated so that the overflow runs into an automatic circuit breaker. A suitable number of accumulators are connected with this circuit breaker separately. This apparatus is composed of a movable receptacle, turning on a horizontal axis, which turns over when full of water. A system of movable contacts puts the battery successively into communication with one of the accumulators at each movement of the circuit breaker. The lamps are supplied directly from the accumulators, which the battery is constantly charging. A Pollak battery of seven elements and eight small accumulators corresponds to 15 lamp hours of 8 c. p., and the cost of maintenance is given as about 0·2d. per candle hour.

© 1890 SCIENTIFIC AMERICAN, INC.

RECENTLY PATENTED INVENTIONS.

Engineering.

CYLINDER AND PISTON MOTOR ENGINE.—Johann C. Grabner and Henri Ruperti, Kupferhammer, near Brackwede, Prussia, Germany. This invention relates to motor engines operated by steam, compressed air, or other expansible gases or vapors under pressure, the invention covering various novel details and combinations of parts.

FURNACE.—Philip Geyer, Newark, N. J. This furnace is designed to provide means whereby the products of combustion are returned over and beneath the grate bars and the gases contained in such products consumed, means being also provided whereby a portion of the waste products of combustion are returned to the fire and a portion utilized to heat the fresh air supply for the boiler.

Railway Appliances.

CAR COUPLING. — Henry P. Maiden, Ord, Nebraska. This is a coupler designed to be fitted at a moderate cost to almost any modern form of drawhead and cars, the peculiar arrangement of a vertically disposed lifting rod or bar admitting of the coupling being used on freight cars having end openings for the passage of articles of freight.

CAR COUPLING. — George S. Gaines, Corona, Ala. This coupler has a swinging fender or guide plate hinged to one wall of the drawhead, its free end being adapted to engage the front face of the coupling pin and close one portion of the mouth of the drawhead, and in combination therewith is a yielding bearing plate on the inner face of the opposite wall of the drawhead, the fender being adapted to guide the coupling link against the bearing plate in coupling.

CAR COUPLING.—Charles F. Francisco, San Diego, Cal. This coupling has an armed dog and a gravity block, the drawhead having the front lower wall of its throat provided centrally with a notch for the arm of the dog and with portions on opposite sides of such notch to form a fulcrum for the link, the gravity block being arranged to bear upon the link in rear of the fulcrum.

CAR COUPLING. — William C. Shaw, White Plains, Md. The drawhead in this device has a sliding latch plate constructed to engage the head of the coupling rod and having a flange for engagement by the head, whereby the head may move the latch plate to position to receive the head, the coupling being effected automatically, while uncoupling may be readily effected from either side of the car.

COUPLING. — James M. Gilmour, East Orange, N. J. This is a device which may be used on railroad cars, but is more especially designed for automatically coupling ferry boats to their slips, the invention consisting of a spring-pressed bolt mounted to turn in bearings on the boat, in connection with setting and releasing devices for placing the bolt in position and automatically releasing it when the boat enters the slip.

Miscellaneous.

TELEPHONE TOLL BOX. — Harry L. Cassard, Baltimore, Md. This box has a coin slot and chute in which a coin is to be inserted, and serves to throw the telephone into circuit and render it operative, in this way exacting tolls from persons using the telephone.

SPACING INSTRUMENT. — Hiram R. Gale, Minneapolis, Minn. This is a device for the use of printers for measuring and marking into equal spaces cardboard, paper, etc., and consists of a series of marking arms mounted upon and combined with a set of lazy tongs, whereby a less or greater space will be indicated alike by all the arms of the series.

CASH CARRIER. — Harry P. During, Carthage, Mo. This carrier has a track preferably of metallic strips about an inch wide and an eighth of an inch thick, the strips being held in brackets suspended from the ceiling, the invention covering a novel construction and arrangement of parts whereby it is designed to provide for the delivery of heavy packages or of light packages over the same track.

TYPE WRITER ATTACHMENT. — William B. Northrop, Charleston, S. C. This is a device for quickly and easily cleaning the faces of types used in type writing machines, the invention consisting of a brush held to the paper carriage and adapted for contact with the faces of the type.

MUSIC LEAF TURNER. — Peter Jung, Perham, Minn. This device is mounted on the usual music stand or back, and has an offset on which rests the lower end of the book or leaf, there being pivoted in the middle of the offset an upwardly extending rod adapted to engage a hook on the upper end of the back, the device being easily and quickly adjusted, and being operated by a slight touch of the finger.

COIN-OPERATED VENDING MACHINE. —Frederic B. Cochran, New York City. This is an apparatus for automatically delivering small wares, such as confections, chewing gum, cigarettes, etc., on payment of a proper coin passed into the machine by a purchaser, the invention being an improvement on a former patented invention of the same inventor, and designed to provide a compact, efficient, and comparatively inexpensive machine.

TWINE CUTTER. — George E. Tripp, Chelsea, Mass. This invention consists of a ring having an attached cutter and designed to be slipped on the thumb or finger, to facilitate cutting string, twine, etc., without having to resort to a cutter on a counter or pick up a separate cutting implement.

CLIP FOR SILVER WARE CASES. — Henry Siebert, Bayonne, N. J., and William Siebert, New York City. This clip is made with a slotted block and inverted U-shaped spring arms, each having short legs arranged opposite each other and long legs fitted into the slots of the block, the invention being an improvement on a former patented invention of the same inventors.

PAPER BOX.—John H. Riedell, Brooklyn, N. Y. This is a box designed more particularly for cigarettes, matches, etc., the invention consisting mainly in such construction that the contents of the box may be removed at one side by opening the main top or cover and the outer side wall and also two side flaps.

AUTOMATIC VEHICLE BRAKE. — Linford E. Van Antwerp, Susquehanna, Pa. This is a brake which may be secured to the wagon by only a small number of bolts and staples, and is readily adjustable to all heavy wagons, the tugs being of the same length at all times, the invention being an improvement on a former patented invention of the same inventor.

VELOCIPEDE. — Clarence P. Hoyt, Canon City, Col. In this vehicle a rigid frame is mounted on the driving wheel shaft, a driving lever being fulcrumed between its ends on this shaft, while a crank shaft in the rear is geared to the main shaft, with connections between the lower end of the driving lever and the crank shaft, the vehicle being designed to be exceedingly stable, strong, and durable.

SASH FASTENER. — Henry T. Smith, Carroll, Ohio. This sash lock consists of a casing having parallel wings and a connecting wing uniting their inner ends, there being longitudinal slots in the front face of the parallel wings, and perforations in which lock blocks are held to slide, with other novel features, the device being simple and easily operated, and designed to hold either sash in any desired adjustment.

MAKING ORNAMENTED VENEERS. — Louis Ling, Berlin, Germany. This is a process of manufacture consisting in burning the picture or design in the face of the veneer, coating the back with gum and its face with wax, afterward coating its face with a thin solution of white of eggs, coating with metal foil, and subjecting the veneer to mechanical pressure under a moderately heated die bearing the design.

ELEVATOR ATTACHMENT. — Fred N. Hallett, Portland, Oregon. This is an attachment designed to automatically raise and lower the guard gates of elevator wells, the invention providing convenient and positive means of operating the guard gates, and also to allow the elevator to pass without operating them.

SUCKER ROD AND TUBING ELEVATOR. —Cassius M. Maxson, Allentown, N. Y. This is an improved clamp or clutching device especially designed for lifting pump or sucker rods from oil or other deep wells, the clutch block being formed with a slot and having trunnions which enter the eyes of the bail, thus pivoting the clutch block in the bail.

WINDLASS. — Eliab and Frederick E. Perkins, St. Joseph, Mo. Combined with two rotatable sprocket wheels, which may be very small, is a chain having upper and lower stops, which may be an ordinary chain of any length, with other novel features, the invention providing a device designed to give a maximum of power with a minimum of friction and effort.

INSERTIBLE SAW TEETH. — Nels H. Wheeler and Neil M. Newhouse, Corvallis, Oregon. This is a device for swaging saw teeth in which the swage block is adjustably held to a stock or standard, dies being adjustably supported by the swage block, in combination with a swaging lever and a tooth-holding bar, the invention being an improvement on a former patented invention of the same inventors.

SAW MILL DOG.—James P. Batchelor, Bearden, Ark. This dog is pivoted at its rear end to a knee movable on the head block, the dog being arranged to lap down alongside the head block, on which a lateral projection is provided for engagement by the forward end of the dog as the knee is moved forward.

AXLE CUTTING DEVICE. — Charles A. Thompson, Traverse City, Mich. This is a thread and shoulder cutter consisting of a frame adapted to be clamped to the axle, a crank-actuated spindle in the frame having a chuck with cutters to engage the end of the axle, while a suitable feed mechanism feeds the chuck on the axle, the device being adapted to do its work without removing the axle from the vehicle body.

STRAW TWISTING MACHINE.—Herman A. J. Rieckert, New York City. In this machine, combined with breaking rollers are twisting rollers turning in a revolving wheel, a conical tube being held between the breaking rollers and the twisting rollers, while a rotary knife cuts the twisted band after it leaves the twisting rollers, the machine twisting straw to form bands for binding sheaves of grain.

STIRRUP LEATHER STAY. — Jesse D. Padgitt, Dallas, Texas. This is a U-shaped stay, formed along its upper edges with outwardly extending loops of less length than the stay, the object being to cause the stirrup to hang in proper position for insertion of the rider's foot in mounting.

HARNESS SADDLE.—Marcellus M. Hitt, Sheffield, Ala. This invention consists in a bearing strap lock for harness saddles designed to provide for the play of the bearing straps to conform to the motions, of the horse, with facility for detaching when necessary, but so that the bearing straps are secured against being accidentally detached from the harness.

NEW BOOKS AND PUBLICATIONS.

THE STORY OF A TINDER BOX. By Charles Meymott Tidy. London: Society for Promoting Christian Knowledge; Brighton, New York: E. & J. B. Young & Co. Pp. 105. Price 80 cents.

This attractive little book represents a series of lectures whose best claim of merit is that they are written in the most familiar style. They were delivered to a juvenile auditory by Mr. Charles Meymott Tidy, and are very profusely illustrated. The presentation of the subjects is graphic, and they will really be of interest to all readers. They present in one place a curious instance of inexact conception, the author apparently confusing force and energy, stating that force produces friction, page 61, that "heat is a form of force," page 62, and asks his readers to realize the "energy of force," ibid., whatever that means. Of course heat is a form of energy, not of force, and force alone without motion cannot produce friction. The modern doctrines of force, energy, and work and of their relations to each other might have been consulted with advantage. It is a pity that these errors should have been permitted to stand in a book otherwise most attractive and useful.

TRANSACTIONS OF THE TWENTIETH AND TWENTY-FIRST ANNUAL MEETINGS OF THE KANSAS ACADEMY OF SCIENCE. Topeka. 1889. Pp. 127.

This report of proceedings does credit to the science of the West, and is an interesting and valuable contribution to different branches of natural history.

ILLUSTRATIONS AND DESCRIPTIONS OF TELEGRAPHIC APPARATUS. By Astley C. Terry and William Finn. New York: Electric Arc Publishing Company. 1889. Pp. 100. Price $1.50.

The apparatus in use in the telegraphic world, treated in the most practical way, with numerous illustrations, comprises the subject of this work. It will be of practical use to many.

VIERTELJAHRESSCHRIFT UBER DIE FORTSCHRITTE AUF DEM GEBIETE DER CHEMIE DER NAHRUNGS- UND GENUSSMITTEL DER GEBRAUCHSGEGENSTANDE, SOWIE DER HIERHER GEHORENDEN INDUSTRIEZWEIGE. Berlin: Julius Springer. 1888. Pp. 692. Price $5.

This quarterly periodical is an excellent evidence of the thorough work done by the Germans in the scientific field. Food products and their treatment and the methods used in their analysis are given in great detail and elaboration.

☞ Any of the above books may be purchased through this office. Send for new book catalogue just published.

Address MUNN & Co., 361 Broadway, New York.

SCIENTIFIC AMERICAN BUILDING EDITION.

APRIL NUMBER.—(No. 54.)

TABLE OF CONTENTS.

1. Elegant plate in colors of a residence on Long Island, N. Y., built from plans prepared by Munn & Co. Cost about $6,500. Perspective elevation, floor plans, details, etc.
2. Colored plates, details, and suggestive floor plans for a residence at Buffalo, N. Y., built at a cost of $7,000.
3. Illustrations of an attractive cottage at Excelsior Springs, Mo., erected at a cost of $1,300 complete.
4. A residence at Park Hill, South Yonkers, N. Y., erected at a cost of $8,500. Perspective and floor plans.
5. Perspective elevation and floor plans of a residence recently erected at Belle Haven, Conn., at a cost of $11,000. McKim, Mead & White, New York, architects.
6. Engraving of a Binghamton, N. Y., cottage. Cost $4,950 complete. Floor plans and perspective.
7. Elevation and floor plans of a brick cottage. Cost about $5,000.
8. A double dwelling costing $5,200, built at Portchester, N. Y. Perspective and plans.
9. View of an economical water tower at Hill View Park, South Yonkers, N. Y.
10. A cottage at Mountain Station, N. J., from designs by F. W. Beall, architect, New York. Cost complete $8,000. Plans and perspective.
11. Two carriage houses. Cost about $1,500.
12. Two pages of illustrations showing in general view and detail the wreck of the tower of the Church of the Covenant, at Washington, D. C., which fell when nearly completed on August 22, 1888.
13. A Crescent Place, South Yonkers, N. Y., residence, recently erected at a cost of $7,500. Plans and perspective view.
14. Miscellaneous Contents: Concrete arches.—Dwarf cannas.—Water works for small towns.—Soft stone.—Brick pavements.—Fall of the tower of the Church of the Covenant, Washington, D. C. —Improved duplex plumb and level, illustrated. —Improved anti-friction hanger for sliding doors, etc., illustrated.—Wood's pedal valve for radiators, illustrated.—An improved turnbuckle, illustrated. —Improved copying press, illustrated.—The Wing disk fans, etc.—Mortising and Tenoning machine, illustrated.

The Scientific American Architects and Builders Edition is issued monthly. $2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming, practically, a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fullness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural publication in the world. Sold by all newsdealers.

MUNN & CO., PUBLISHERS,
361 Broadway, New York.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J

Tuerk water motors at 12 Cortlandt St., New York.

Hoisting Engines. The D. Frisbie Co., New York city.

For best hoisting engine. J. S. Mundy, Newark, N. J.

For Sale—Campbell's skylight. Patented March 25, 1890. See article on page 245 of last issue.

Billings' Drop Forged Lathe Dogs, 12 sizes—⅜ to 4 inches. Billings & Spencer Co., Hartford, Conn.

For Sale or Exchange—Two patents. Articles in demand. Address J. R. Wilson, Bloomville, Ohio.

Belting.—A good lot of second hand belting for sale cheap. Samuel Roberts, 369 Pearl St., New York.

Industrial Iron Works, Union City, Pa., mfrs. of 8-light dynamos and water motors. Send for prices.

Best Ice and Refrigerating Machines made by David Boyle, Chicago, Ill. 140 machines in satisfactory use.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

"How to Keep Boilers Clean." Send your address for free 96 p. book. Jas. C. Hotchkiss, 120 Liberty St., N. Y.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

For Sale—A valuable patent feed water heater and condenser. Address John Willenbrink, New Richmond, Ohio.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

The valuable patent for shoe or glove fastener, illustrated on page 261, is for sale by State, county, or entire. For particulars address J. C. Murray, Scranton, Miss.

For low prices on Iron Pipe, Valves, Gates, Fittings, Iron and Brass Castings, and Plumbers' Supplies, write A. & W. S. Carr Co., 138 and 140 Centre St., New York.

For the original Bogardus Universal Eccentric Mill, Foot and Power Presses, Drills, Shears, etc., address J. S. & G. F. Simpson, 26 to 36 Rodney St., Brooklyn, N. Y.

The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

Wanted—A thoroughly competent designer of woodworking machinery by a well established house. To the right party a first-class opening. Address P. O. box 1001, New York, N. Y.

For Sale—Truss patent, No. 414,550, patented Nov. 5, 1889. Proven the best in present market. Either whole or half manufacturing interest. Address H. Klingler, 22 W. Genesee St., Buffalo, N. Y.

For Sale—My patent for cook stove lid damper. Works automatically by expansion and contraction. Fits any stove. Will sell entire or by States or cities. Address, with stamp, J. H. Haldeman, Marietta, Pa.

Superintendent wanted by a large manufacturing concern in a large center, working iron and wood, chiefly the former. Must be a thoroughly educated mechanic and a draughtsman, energetic, experienced, and competent to handle large numbers of men. Young man preferred. Give full experience, references, and age. Address "Superintendent," care Scientific American, N.Y.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(2133) A. M. S. asks: What cheap compound can I use in taking casts from an intricate plaster of Paris mould, which shall be elastic enough to be readily removed from the mould, and yet which shall not shrink, or become viscous in warm weather? A. To 10 pounds of glue take ½ to 1 pound glycerine. First soak the glue alone, then heat and dissolve and add the glycerine.

(2134) C. N. F. asks: What quantity of chloride of lime should be put to one gallon of water to take mildew out of white duck window awnings? A. Use as little as possible. Start with one ounce. It tends to rot the cloth.

(2135) L. A. asks how mango chutney is made. A. Chillies 1½ pounds, unripe mangoes (or apples) 1 pound, red tamarinds 2 pounds, sugar candy 1 pound, fresh ginger root 1½ pounds, garlic ¾ to 1½ pounds, sultana raisins 1½ pounds, fine salt 1 pound, and 5 bottles of the best vinegar. Soak the chillies for 1 hour in the vinegar, then grind all with a stone and muller to a paste.

(2136) C. W. C. writes: Can you tell me why ice exposed to March wind or sun becomes "combed," while if exposed in summer months it melts without combing. A. Ice evaporates, and its wasting in cold weather is due partly to this. Its wasting in warm weather is due to melting. This accounts probably for the difference you speak of.

© 1890 SCIENTIFIC AMERICAN, INC.

(2137) R. P. B. asks why I could not melt brass in a crucible so it would run in a forge. We built a big fire as high as the crucible blowed it for two hours, and it only melted out of shape, not enough to run. Could melt a little in an iron ladle. We put borax in it. Can you give me a method for breaking bowlders, they are so hard that a drill won't stand. A. You can melt brass in a forge fire, 5 or 6 pounds, in a crucible just large enough to hold the metal. Say a brick wall around the crucible a foot high and with space equal to the diameter of the crucible all around for coal. Use charcoal to start the fire and fill up with anthracite or coke. Cover the top of the crucible with a piece of charcoal. No borax or flux. Bowlders of one or two hundred pounds should be split with a heavy sledge. Larger ones can be drilled with a hard drill made of the best tool steel.

(2138) German Reader asks: 1. Can I decompose water with a small alternating current machine? A. Yes. 2. Will this readily mix the gases. A. The gases will necessarily be mixed. 3. Will there be any danger that they will explode when leading through an iron pipe? A. There will be danger unless the electrodes are kept under water. 4. Will a drum armature for the simple electro motor answer just as good as the Gramme type. A. Yes.

(2139) W. S. asks where to get a good book on plumbing. A. "Standard Practical Plumbing," by Davis, $3; also Clark's "Plumbing Practice," $3.

(2140) B. T. H. writes: Can you tell us of some good formula for mixing oil and water in equal quantities so that the mixture will stay together for several hours? A. Use a solution of gum tragacanth; you will have to determine by experiment the strength required.

(2141) L. P. H. writes. We wish instructions for making rubber stamps. A. In SUPPLEMENT, Nos. 249, 251, and 252 you will find the whole subject of the manufacture of India rubber described. In making stamps pure gum mixed with sulphur is pressed into a warm mould and held so pressed while heated in a vulcanizer.

(2142) H. O. T. writes: Have an ivory mouthpieced flute, badly discolored by smoke. How can I remove the yellow stain without affecting the polish? A. The first remedy to be tried is to expose to the sun under a piece of glass, next expose to the sun under spirits of turpentine. Finally try washing with binoxide of hydrogen containing a little ammonia.

(2143) W. M. S. writes for a recipe for making Florida water. A. Oil of bergamot 8 ounces, do. of orange 4 ounces, do. of lavender (best) 3 ounces, do. of cloves 1½ ounces, do. of cinnamon (true) ¼ pint, tincture of orris ½ pint, do. of Peru balsam ¼ pint, alcohol 95 per cent 4 gallons. Water 6 pints. Mix, leave at rest for some days, filter, and bottle.

(2144) C. P. writes: The writer wishes to get a recipe for fly paper or the material that is put on the paper? A. Various preparations for sticky fly paper are given. Linseed oil thickened with resin is very good. Other formulæ read thus: *a*. Resin 8 parts, turpentine 4 parts, rapeseed oil 4 parts, honey ½ part. *b*. Resin 6 parts, rapeseed oil 4 parts, resin 3 parts. *c*. Boil to a thick paste 1 pound resin and 3½ ounces each of molasses and linseed oil.

(2145) W. H. D. asks how to transfer all kinds of printed matter on to zinc. A. For zincography we refer you to our SUPPLEMENT, Nos. 584, 143, 656, 438, 587, and others. 2. Also give me a receipt for making a good cologne. A. There is much difficulty in making good cologne. The commercial alcohol is apt to give it an inferior odor. The following is for a cheap cologne.

Oil of bergamot, lemon, orange, and rosemary	1 oz.
Oil of cloves	1 drm.
Tincture of orris	4 oz.
Alcohol	1 gal.
Water	3 pts.

3. I tried making gun powder, but must have made some mistake, for it won't harden. It turns to a kind of a dust. What is wrong with it? A. You probably did not reduce it to fine enough powder. The secret of making good powder is to reduce it to an impalpable consistency. 4. How is pitch made? A. By distilling or boiling down tar.

(2146) Amateur asks: 1. Would a battery made out of eight common tumblers filled with a bichromate of potash solution be very powerful? Zincs and carbons each 3 inches long, ¼ inch thick and 1½ inches wide. One zinc and carbon in each tumbler. A. It would form a very good battery for experimental purposes. It would be better to double the carbon surface. 2. Would electric light pencils do as well as the plate carbon? If so, how many pieces of the electric light carbons should I use in each tumbler? A. The pencils would answer. Use enough carbon to furnish a surface twice as large as that of the zinc. 3. How many candle power incandescent lamps could you use if you used plate carbon, how many with pencils? A. It will require from 2 to 6 cells for each lamp, depending upon the candle power of the lamp.

(2147) Iowa asks what time it takes for messages to go from one end of the Atlantic cable to the other? A. About 3 seconds is the general estimate.

(2148) O. asks what apparatus is used for the production of chlorine in the chlorination of refractory gold ores, and also the name of any books giving a description of this process. A. See the SCIENTIFIC AMERICAN of March 1, 1890, for description of a chlorination apparatus.

(2149) D. E. S. asks: 1. What could I mix with writing fluid (say Sanford's), so it would not dry for two hours after writing, and not spoil its writing qualities? A. This cannot be done. Sugar or glycerine will retard drying, but will affect the quality. 2. Recipe for a paste to make stereotyper's plug for matrix. A. Use paste given below. 3. Process for mixing and baking the plates for the chalk process of engraving. A. Roughen the copper base with sand paper and rub it over with white of egg. Flood it with a thick wash of whiting 24 ounces, water 3 pints, stereotype paste (as below), 6 ounces. Stereotype paste: Whiting 6 pounds, water 2 gallons, wheat flour 4½ pounds, boil and add soft glue or size 14 pounds, carbolic acid 4 ounces. A layer one-twentieth to one-thirtieth inch thick can thus be produced, and the plate is allowed to dry in a horizontal position. After tracing the design, bake at a temperature of 392° Fah., and cast the metal upon it after placing in a proper frame.

(2150) Gyps writes: Would like to know what proof whisky is composed of, and the different oils that it contains. A. Proof spirit is defined by law as that mixture of alcohol and water which contains one-half its volume of alcohol at 60° Fah., such alcohol being of sp. gr. 0·79390 referred to water at its point of greatest density. It contains at 60° Fah. in 100 volumes 50 volumes of absolute alcohol and 53·71 volumes of water. A number of receipts for artificial whiskies are given in the "French Wine and Liquor Manufacturer," which we can supply for $3.

(2151) W. H. McG. asks for a recipe for a glue that will glue rubber to glass so that alcohol will not affect it. A. Use a freshly made mixture of gum tragacanth with water. It should be about as thick as butter. Or try Canada balsam.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

April 8, 1890,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Abrading cylinder, L. D. Forbes ... 425,376
Air moistening apparatus, E. Korting ... 425,329
Alarm. See Burglar alarm. Knife and burglar alarm.
Ammeter, M. M. Garver ... 425,069
Animal trap, J. A. Latta ... 425,136
Annunciator drop, electrical, M. Hynes ... 425,078
Awning rope reel, C. M. Fisk ... 425,313
Axle cutting device, C. A. Thompson ... 425,192
Badges, etc., picture holding attachment for, O. W. Bennett ... 425,201
Balling machine, E. E. Biederman ... 425,092
Ballot box, M. M. McIlvain *et al* ... 425,238
Bar. See Draw bar. Furnace grate bar.
Barbers' chairs, registering attachment for, J. P. Meyer ... 424,992
Basin cover, catch, A. J. Bayley ... 425,198
Bearing, thrust, B. C. Smith ... 425,263
Bed, folding, E. E. Herrinton ... 425,378
Bed lounge, T. D. Hanchett ... 424,980
Beehive, W. D. Pennock ... 425,047
Beer, apparatus for the pasteurization of, T. Evans ... 425,310
Bench. See Saw filing bench.
Bending rods for bit braces, machine for, L. C. Wilcox ... 425,157
Berry picker, Carpenter & Briggs ... 425,299
Bicycle, McCune & Yost ... 424,994
Bicycle, C. D. Rice ... 425,390
Bin. See Flour bin.
Bit. See Bridle bit.
Blacking stand, boot, R. D. Fannon ... 425,027
Block. See Brake block.
Blood, instrument for the transfusion of, E. E. Allen ... 424,944, 425,015
Board. See Ironing board. Miter board. Switch board.
Boiler. See Steam boiler.
Boiler furnace, J. S. Harkins ... 425,072
Boiler furnace, E. L. Moore ... 425,236
Boiler furnace, steam, J. M. Evans ... 425,309
Bolt heading machine, S. F. Green ... 424,975
Book cover, G. M. Bowen ... 425,291
Boot or shoe, L. Vanalstine ... 425,353
Bouquet holder, Moore & Schreyer ... 425,082
Box. See Ballot box. Fire box. Letter box. Paper box. Smoke box. Telephone toll box.
Box making machine, M. E. Brigham ... 424,953
Bracket. See Shelf bracket.
Bracket, W. P. Maxim ... 425,182
Braid, stopping device for machines for grading and reeling straw, D. Brown ... 425,204
Brake. See Locomotive and train brake. Vehicle brake.
Brake block, Butts & Edmonds ... 425,206
Brake mechanism, fluid-pressure automatic, G. Westinghouse, Jr ... 425,059
Bridle bit, A. J. Crose ... 425,212
Brooms from wood splints, manufacturing, G. W. McKim ... 425,043
Brooms, wood splint for manufacturing, G. W. McKim ... 425,044
Bucksaw frame, N. H. Roberts ... 424,999
Building, portable or sectional, E. T. Potter ... 425,250
Burglar alarm, J. Moran ... 425,143
Burglar alarm, M. J. Newhouse ... 425,045
Burner. See Gas burner. Oil or gas burner.
Button machine, D. A. Carpenter ... 425,209
Calipers, G. Carlyle ... 425,208
Camera. See Photographic magazine camera.
Camera, C. F. Getler ... 425,130
Can. See Creaming can. Sheet metal can.
Can heading machine, W. D. Brooks ... 425,295
Cannon, constructing and loading, L. Gathmann ... 424,969
Cannon, loading, L. Gathmann ... 424,970
Car coupling, C. F. Francisco ... 425,166
Car coupling, G. S. Gaines ... 425,167
Car coupling, H. P. Maiden ... 425,181
Car coupling, C. G. Ruby ... 425,001
Car coupling, W. C. Shaw ... 425,189
Car coupling, J. P. Vaughn ... 425,275
Car door fastener, P. & C. Hornal ... 425,323
Car, electric railway, R. M. Hunter ... 425,077
Car fender, cable, G. E. Rhodes ... 425,049
Car for transporting poultry, stock, J. Nolan ... 425,242
Car, poultry, J. Nolan ... 425,241
Car running gear, street, F. W. Judson ... 425,380
Car seat, M. G. Keeran ... 425,328
Carding engine, L. L. Williams ... 425,091
Carpet stretcher, S. Boice ... 425,160
Carpet stretcher and tacker combined, W. I. Ludlow ... 425,127
Carriage spring, G. T. Chapman ... 425,162
Carriage top lifter, J. T. Dysard ... 425,126
Carrier. See Cash carrier. Grain carrier. Trace carrier.
Case. See Watch case.
Cash carrier, H. P. During ... 425,094
Cash carrier, W. S. Soloman ... 425,007
Cash indicator, Blackhall & Smith ... 425,121
Chair. See Suspended adjustable chair.
Chair, A. Blum ... 424,952
Channel cutter, C. F. T. Salger ... 425,003
Check and ticket, baggage, H. A. Deraismes ... 424,963
Checkrein, L. G. Sprague *et al* ... 425,055
Chest. See Tool chest.
Chloralformamide, J. F. Von Mering ... 425,039, 425,040
Chuck, J. Hartness ... 425,224
Chucks, reversible jaw for, L. E. Whiton ... 425,279
Churn closure, A. H. Reid ... 425,147
Cigar machine, J. J. Becker ... 425,120
Cisterns, dome, support for arching, W. H. H. Davis ... 425,124
Clamp. See Woodworking clamp.
Clamp for moulders' flasks, etc., E. E. Josef ... 424,988
Clasp. See Corset clasp. Envelope clasp. Umbrella clasp.
Cleaner. See Flue cleaner. Stovepipe cleaner.
Clip. See Silverware case clip.
Clocks, electric alarm device for, R. Schmitz ... 425,004
Closet, S. H. Nutting *et al* ... 425,083
Cloth, apparatus for holding bolts of, J. Talbert ... 425,011
Cloth cutting machine, M. Kohn ... 425,102
Cloth pressing machine, G. Gessner ... 424,971
Clothes drier, T. B. Ward ... 425,355
Clothes pounder, H. Youmans ... 425,360
Clothes wringer, O. D. Hudson ... 425,074
Coating chills, composition for, Royal & Turner ... 425,346
Coffee or tea pot handle, E. F. Smith ... 425,349
Collar stuffing machine, horse, R. Brownson ... 425,063
Cooker, feed, Carpenter & Moutague ... 425,300
Cooking apparatus, E. Atkinson ... 424,949
Connecting rod, R. W. Aitken ... 425,119
Cord, twine, etc., ball of, A. C. Miller ... 425,381
Corset clasp, C. M. Thomas ... 425,012
Cotton scraper, J. M. Crews ... 424,962
Coupling. See Car coupling. Pipe coupling.
Coupling, J. M. Gilmour ... 425,171
Crate, F. A. Rappleye ... 425,253
Creaming can, R. D. Parks ... 424,996
Cultivator, S. L. Allen ... 424,946
Cultivator, S. C. Cobb ... 425,210
Cultivator, J. T. Greenwood ... 425,030
Cultivator and planter, P. Montecino ... 425,337
Cultivator, hand, J. W. Stanley ... 425,150
Cultivator tooth, T. K. Goodbey ... 424,973
Cup. See Oil cup. Umbrella drip cup.
Curtain rack, W. Meyer ... 425,336
Cutter. See Channel cutter. Rotary cutter. Twine cutter.
Cylinder and piston motor engine, Grabner & Ruperti ... 425,172
Dental plugger, F. C. Ries ... 425,344
Die. See Pipe threading die.
Digger. See Potato digger.
Disk engine, J. P. Eastman ... 425,213
Distilling water, Gerdes & Thoens ... 425,316
Door lock and latch, H. Morton ... 425,237
Dough, machine for forming loaves of, F. Westerman ... 425,278
Draught equalizer, A. Hunt ... 424,987
Draw bar, J. H. Elliott ... 425,308
Dredger derrick, C. H. Sage ... 425,257
Drier. See Clothes drier.
Dumping bucket, W. E. & E. S. Ludlow ... 424,989
Dustproof joint, E. F. Roberts ... 425,050
Easel, E. A. Jeffery ... 425,177
Eccentric, shifting, J. M. Branch ... 425,293
Electric meter, M. E. Thompson ... 425,269, 424,270
Electric wire pole, L. R. Greene ... 425,071
Electrode, galvanic battery, W. P. Kookogey ... 425,135
Electrodes for batteries, manufacturing metallic, F. Marx ... 425,335
Elevator. See Hydraulic elevator. Sprocket and chain elevator.
Elevator, C. F. Taylor ... 425,152
Elevator attachment for operating gates, F. N. Hallett ... 425,174
Elevator lock, L. F. Tebel ... 425,268
Engine. See Carding engine. Cylinder and piston motor engine. Disk engine. Gas engine, Steam engine. Traction engine.
Envelope clasp and tag, A. L. Sewell ... 425,053
Fastening device, J. A. Turnbull ... 425,115
Fence post, W. C. Gholson ... 425,317
Fender. See Car fender.
Fiber from aquatic plants, machine for obtaining, J. Graner ... 425,318
Fiber rubbing machine, A. Scott ... 425,006
Filter, C. B. Elliott ... 425,374
Finger ring, R. Fouchs ... 425,096
Fire box, steam generating, Beardslee & Hand ... 425,200
Fire extinguisher, J. J. Harden ... 425,221
Fireplace heater, A. E. Lytle ... 425,103
Fishing reel, C. Nordenholt ... 425,243
Flock, sand, tinsel, etc., distributer for, G. Muller ... 425,338
Flour bin and sifter, J. N. Beall ... 425,286
Flour bin and sifter, combined, G. A. Markham ... 425,334
Flood gate, D. N. Kratzer ... 425,179
Flue cleaner, steam, W. Doty ... 425,165
Fluid controller, J. C. MacEvitt ... 425,234
Frame. See Bucksaw frame.
Fuel, artificial, G. Y. Smith ... 425,351
Fuel, composition for treating, J. C. Cooper ... 424,961
Fuel, method of and apparatus for manufacturing artificial, G. Y. Smith ... 425,350
Furnace. See Boiler furnace. Gas furnace.
Furnace, P. Geyer ... 425,170
Furnace, J. Weber ... 425,393
Furnace grate bar, A. J. Bayley ... 425,199
Furrower and coverer, E. Wyckoff ... 425,359
Gauge. See Press slide gauge. Saw table gauge.
Gauge knife, G. W. Duchemin ... 425,965
Game, P. Johnson ... 425,100
Game, G. Poggenburg ... 425,249
Gas burner, Bunsen, L. Paget ... 425,246
Gas engine, Valentine & Grigg ... 425,116
Gas furnace, M. V. Smith ... 425,260
Gas mains, means for carrying off leakage from, H. Cowell ... 425,369
Gate. See Flood gate. Water way gate.
Gate, J. H. Tudor ... 425,273
Glass, machine for the manufacture of plate, P. Simon ... 425,348
Governor for power engines, automatic, A. Willmer ... 425,118
Grain carrier, E. B. Keith ... 425,229
Grain meter, automatic, L. A. Gillett ... 424,972
Grain reduction machine, G. A. Buchholz ... 425,366
Graphophony, D. W. Brown ... 424,956
Grinding machine, A. B. Landis ... 425,230
Grinding machine, G. J. Ridley ... 425,186
Hame fastener, Johnson & Granger ... 425,080
Hammer, bush, J. O. Therien ... 425,153
Handle. See Coffee or tea pot handle.
Handle, N. R. Streeter ... 425,352
Hanger. See Tobacco hanger.
Harness rosette, Ireland & Bradley ... 425,228
Harrow, J. B. Shores ... 425,148
Harvester binder, F. D. & J. S. Mercer ... 425,139
Harvester, corn, J. R. & R. N. Gebby ... 425,315
Hatchway, elevator, H. Hermann ... 425,227
Heater. See Fireplace heater. Water heater.
Heater, J. S. Harkins ... 425,222
Heating system, J. F. McElroy ... 425,384
Heel trimmer, C. H. Helms ... 425,321
Hinge for school seats, O. S. Garretson ... 425,098
Hitching anchor, W. W. McKay ... 425,385
Hitching strap holder, A. Nellinger ... 425,144
Hoisting machinery, R. C. Smith ... 425,261
Holder. See Bouquet holder. Hitching strap holder. Jar holder.
Hook. See Trace hook.
Hose, R. Wright ... 425,283
Hose support, fire, C. R. Robinson ... 425,256
Hub band, E. Storm ... 425,008
Hulling machine, H. B. Stevens ... 425,111
Hydraulic elevator, S. W. Blanchard ... 425,202
Ice creeper, C. Cooper ... 425,093
Ice tool, O. P. Jaques ... 425,325
Illuminating apparatus, Wallwork & Wells ... 425,154
Illuminating buildings with coal oil, apparatus for, A. S. Cody ... 425,302
Indicator. See Cash indicator.
Inkstand, pistol case, and burglar alarm, combined, M. Siersdorfer ... 425,347
Instep supporter, J. Hibbitt ... 425,133
Insulating coverings on electrical conductors, machine for weaving, C. T. Stetson ... 425,056
Ironing board and bosom stretcher, combined, D. A. Phelps ... 425,048
Ironing machine, A. T. Hagen ... 424,976
Jack. See Lifting jack.
Jar holder and filler, I. F. Field ... 425,312
Joint. See Dustproof joint. Lock joint.
Knife. See Gauge knife. Table knife.
Knife and burglar alarm, combined, W. H. Sutton ... 425,010
Knitting machines, feeding attachment for circular, C. J. Appleton ... 425,362
Lamp, central draught, H. J. Williams ... 425,281
Lantern, signal, C. D. Oatman ... 425,244
Lantern, tubular, C. J. Higgins ... 424,983
Lathing, metallic, W. Orr ... 425,245
Leaf turner, M. Kyle ... 425,180
Letter box, W. W. Haskell ... 425,225
Lifter. See Carriage top lifter.
Lifting jack, C. S. Winey ... 425,358
Lighting and advertising system, electric, A. Douglass ... 425,125
Lightning arrester, J. D. Bishop ... 425,061
Lock. See Door lock. Elevator lock.
Lock joint, sheet metal, L. L. Sagendorph ... 425,002
Locomotive and train brake, R. Weigel ... 425,356
Loom, E. D. Hilton ... 425,379
Loom weft tension regulating device, J. Widmer ... 425,014
Marquetry, Clark & Briggs ... 424,958
Matting or similar fabric, straw, I. Lindsley ... 425,090
Men-of-war or merchantmen, light protection for, L. P. De la Barriere ... 425,363
Meter. See Electric meter. Grain meter.
Miter board, J. H. Rowland ... 425,051
Moulding machine for hollow ware, J. C. Richardson ... 425,255
Motor. See Pump motor.
Motor, Friess & Walzer ... 425,097
Mower, W. R. Baker ... 425,016
Music leaf turner, P. Jung ... 425,178
Oats or cotton seed, machine for hulling, M. W. Leonhardt ... 425,331
Oil cup, J. T. Hayden ... 425,031
Oil or gas burner, F. R. Fennessy ... 424,964
Ordnance, recoil check for, W. Anderson ... 424,947
Ore leaching apparatus, Dennes & Rose ... 425,025
Organ, reed, C. S. Warren ... 425,155
Organ stop-action, reed, C. S. Warren ... 425,156
Oven, baker's, J. H. Eisenhart ... 425,307
Oxides of metals, apparatus for manufacturing, S. R. & A. C. Bradley ... 425,292
Packing, engine, Moseley & Blundstone ... 425,042
Packing, metallic, W. T. Harris ... 424,978
Paper bag making machine, J. Arkell ... 425,197
Paper box, J. H. Riedell ... 425,188
Paper, bundle of toilet or wrapping, O. H. Hicks ... 425,033
Pavement, J. J. Schillinger ... 425,258
Photographic dark rooms, lamp for use in, F. Haes ... 425,319
Photographic magazine camera, F. H. D. Schwarz ... 425,005
Picker. See Berry picker.
Picker cylinder and applying coverings thereto, F. G. & A. C. Sargent ... 425,087
Pipe bending core, Wingate & Mell ... 425,395
Pipe coupling, J. C. Bayles ... 424,951
Pipe hooks, process of and machine for making, H. Lilley ... 425,232
Pipe threading die, J. C. Williams ... 425,394
Pipe wrench, A. J. Curtis ... 425,371
Planter, L. C. Berrien ... 425,364
Plow, Beard & Spears ... 425,287
Plow, J. J. Cook ... 425,211
Plow shield, J. Shearer ... 425,259
Plow, shovel, G. A. Jacobs ... 425,079
Plug, basin, T. Susemihl ... 425,113
Plumber's trap, T. McHugh ... 425,339
Pocket fastener, B. Woodsford ... 425,060
Post. See Fence post.
Potato digger, S. L. Allen ... 424,945
Press slide gauge, Hart & Corscaden ... 425,131
Printing and numbering machine, letter press, D. Carlaw ... 425,298
Printing frame support, A. J. Dawdy ... 425,306
Printing machine off-set mechanism, C. B. Cottrell ... 425,123
Protractor, bevel, Hakewessell & Rand ... 424,977
Pulley, C. F. Henderson ... 425,322
Pulley, cable tramway, W. E. & W. M. Winby ... 425,282
Pulley, self-oiling, D. D. Tompkins ... 425,272
Pump, electric rotary, E. I. Nichols ... 425,106
Pump, force, J. W. Powers ... 425,389
Pump motor, railway, J. Johnson ... 425,327
Pump operating apparatus, F. Goodfellow ... 425,216
Pump, steam vacuum, O. R. Davis ... 425,024
Puzzle, G. Miller ... 425,041
Racecourse, automatic, A. M. Coyle ... 425,370
Rack. See Curtain rack. Wagon bed rack.
Railway apparatus, electric, J. B. Odell ... 425,388
Railway brake shoe, J. A. Criswell ... 425,304
Railway conductors, support for electric, C. J. Kilian ... 425,101

© 1890 SCIENTIFIC AMERICAN, INC.

Railway rail joint fastener, E. J. Byrne 425,207
Railway rails, apparatus for reducing, W. H. Howells 425,073
Railway switch, L. M. Garfield 424,968
Railway tie, S. D. Stauffer 425,266
Railways, automatic catch for inclined, R. L. P. Henne 425,226
Railways, crossing for elevated cable, E. R. Guerra 425,220
Raisin seeder, A. C. Moncrief 425,142
Reel. See Awning rope reel. Fishing reel.
Register. See Time register.
Rendering tanks, apparatus for consuming the gaseous products of, N. A. Foster 425,314
Ring. See Finger ring.
Rivet, W. C. Bray 425,294
Rockers, spring and bracket connection for platform, G. J. Shults 425,149
Rod. See Connecting rod. Sucker rod.
Rolling and polishing machine, combined cold, W. G. Howell 424,985
Roof, sheet metal, E. A. Mallory 425,104
Rotary cutter and trimmer, A. B. Fowler 425,214
Rubber, hand, H. M. Snyder 425,054
Running gear, Stanley & Cloyes 425,391
Saddle, harness, M. M. Hitt 425,175
Safe, vault, etc., J. Whittaker 425,280
Sail, J. Cook 425,122
Sand band, A. L. Putnam 425,252
Sash fastener, C. H. Brown 425,203
Sash fastener, N. A. Buckingham 425,021
Sash fastener, F. J. Main 424,990
Sash fastener, H. T. Smith 425,191
Sash, reversible window, Reguin & Kingston 425,146
Saw filing bench, M. Y. Lewis 425,332
Saw guide, T. Robert 425,085
Saw guide, band, R. McChesney 425,105
Saw jointer and gauge, N. H. Roberts 424,998
Sawmill dog, J. P. Batchelor 425,158
Sawmill set works, R. E. Nevin 425,386
Sawmills, sawyer's gauge for, H. A. Duncan 425,373
Saw table gauge, A. Capron 425,297
Saw teeth, device for swaging insertible, Wheeler & Newhouse 425,196
Saws, feed device for, J. Harley 425,223
Screen, J. W. Boughton 425,290
Screw machine tool, J. Hartness 424,979
Screw machines, stock feeding mechanism for, J. Hartness 425,377
Screw threads, die for swaging, H. K. Jones 425,035
Seat. See Car seat.
Seed meal into cakes, machine for forming cotton, J. S. Price 425,251
Seeding machine, W. A. Van Brunt 425,274
Sewing machine, W. Weber 425,277
Sewing machine binding attachment, H. E. Barnett 425,285
Sewing machine shuttle, French & Meyer 424,966
Shafting, hollow, W. G. Howell 425,324
Sheet metal can, T. B. Hidden 424,982
Sheet metal spheroids, manufacture of spirally corrugated, E. Gothberg 425,099
Shelf bracket, M. R. Jewell 425,326
Shelf, library, F. C. Van Doren 425,117
Shelf, revolving, F. C. Van Doren 425,354
Ships' boats from their supporting tackles, apparatus for disengaging, Betham & Woolnough 425,018
Shirt, L. Cohen 424,959
Shoe, E. Rau 425,254
Shoes during treeing, device for protecting the fair stitching on, C. Shoettle 425,088
Shoe fastening, A. Chapdelaine 425,301
Shutter fastener, F. H. Langson 425,330
Silverware case clip, H. & W. Siebert 425,190
Skin cleaning apparatus, J. Straiton 425,112
Smoke box, G. S. Strong 425,267
Snow excavator, D. P. Bier 425,365
Soap and carbonic acid, simultaneous manufacture of, E. D. Mellen 424,991
Soldering machine, can, W. D. Brooks 425,296
Sole edge burnishing machine, W. Gordon 425,217
Sole pressing machine, W. Gordon 425,218
Spacing instrument, H. R. Gale 425,168
Speaking tube, E. T. Orne 425,046
Spoke socket, L. H. Miller 425,141
Spring. See Carriage spring. Vehicle spring.
Sprinkler, J. Oswald 425,340
Sprocket and chain elevator, Marchant & Patnoe 425,037
Stack cover, J. Broughton 424,955
Stand. See Blacking stand.
Steam boiler, sectional, G. E. Tregurtha 425,013
Steam engine, R. Addy 425,361
Steam launches, weed cutter for, A. C. & J. K. Bower 425,019
Steam trap, J. O. Richardson 425,108
Steering apparatus, steam, F. C. Lang 425,036
Stirrup leather stay, J. D. Padgitt 425,184
Stonework, marker, cutter, and polisher for plastic, E. K. Smith 425,110
Stool, Daniels & Kane 425,305
Store service apparatus, W. R. Cole 425,023
Store service apparatus, H. P. During 425,026
Store service apparatus, C. E. Foster 425,028
Stove, cooking, J. S. Harkins 425,320
Stove, gas, J. A. Frey 424,967
Stovepipe cleaner, E. B. Van Vorce 425,057
Stoves, flame extinguisher for oil, H. H. Ashenden 424,948
Stoves or grates, deflecting plate for open, S. Boal 425,289
Straw twisting machine, H. A. J. Rieckert 425,187
Sucker rod and tubing elevator, C. M. Maxson 425,183
Sulky, McMurray & Fisher 425,239
Supporter. See Instep supporter.
Suspended adjustable chair, H. S. Peck 425,248
Suspenders, E. Gutmann 425,173
Switch. See Railway switch. Telephone switch.
Switch, A. R. Bush 425,205
Switch board, E. A. Owen 424,995
Syringe, embalming, T. Holmes 425,134
Table. See Time table. Turn table.
Table knife, F. W. Brittin 424,954
Tank. See Water closet tank.
Tap and die, W. S. F. Dillon 425,372
Telegraph, balanced pen for autographic, H. Etheridge 425,066
Telepraphs, central office system for autographic, J. H. Robertson 425,086
Telpherage, system of, J. E. Maynadier 425,038
Telephone switch, E. P. Warner 425,058
Telephone toll box, H. L. Cassard 425,161
Telephone toll box and connection register, C. E. McCluer 424,993
Thermostat, W. F. Singer 425,089
Thermostatic coil, D. W. Thompson 425,114
Tie. See Railway tie.
Time register, L. W. Tiffany 425,193
Time table, route, S. W. Ralph 425,084
Tobacco hanger, J. G. Anderson 425,284
Toboggan, coasting, J. S. W. Mackintosh 425,138
Tool chest, J. A. Franklin 425,215
Tooth separating mechanism, J. N. Farrar 425,067
Top, musical, G. Cole 425,368
Toy, J. A. Raabe 425,343
Trace carrier, J. G. Miller 425,235
Trace for single harness, W. B. Hinton 424,984
Trace hook, P. Bartzen 424,950
Traction engine, R. C. Smith 425,262
Trap. See Animal trap. Plumber's trap. Steam trap.
Trimmer. See Heel trimmer.
Truck and weighing scales, combined hand, H. W. Thurston 425,271
Trunk, F. J. Palica 425,247
Truss, G. W. Bell 425,159
Tube. See Speaking tube.
Tubing or tubular cups, forming ornamental, J. Burkhardt 425,022
Tubing, socket tip for flexible, A. Caldwell 425,367
Tug, hame, W. G. Riley 425,345
Turn table, J. C. H. Stut 425,151
Twine cutter, G. E. Tripp 425,194
Type bars, machine for producing, O. Mergenthaler 425,140
Type cleaning attachment for writing machines, W. B. Northrop 425,387
Umbrella clasp, W. R. S. Fluck 425,128
Umbrella drip cup, H. Rohrer 425,109
Valve, automatic, W. S. Gray 424,974
Valve, automatic water, M. Maginn 425,333
Valve, cut-off, C. R. James 425,176
Valve, engine, W. M. Smith 425,264
Valve for hydraulic machinery, safety chuck, H. Warden 425,276
Valve for locomotives, relief, W. M. Smith 425,265
Valve gear for engines, exhaust, N. T. Greene 425,219
Valve gear, gas engine, W. Heckert 425,132
Valve seater, J. Carey 424,957
Valve, steam engine, W. Gehring 425,169
Vaporizing and burning hydrocarbon oils, apparatus for, J. L. Styron 425,009
Varnishing and polishing mouldings, machine for, Hussey & Woodward 425,034
Vehicle brake, automatic, Hunter & Sheerer 425,075
Vehicle brake, automatic, L. E. Van Antwerp 425,195
Vehicle, electrically propelled, R. M. Hunter 425,076
Vehicle spring, D. W. Glidden 425,029
Vehicle standard, S. Graham 425,070
Vehicle wheel, R. L. Ewing 425,095
Vehicle wheel, F. Newhouse 425,240
Vehicle wheel, metallic, G. H. Everson 425,311
Velocipede, Barrow & Guest 425,017
Velocipede, J. L. Ferson 424,965
Velocipede, C. P. Hoyt 424,986
Velocipede, A. J. Samuels 425,052
Vending machine, coin-operated, F. B. Cochran 425,163
Veneers, manufacturing ornamented, L. Ling 425,233
Vessels in fogs, means for distinguishing, W. Nelson 425,145
Voltmeter, M. M. Garver 425,068
Vulcanite, producing configurations on, A. Wendlinger 425,357
Wagon attachment, W. W. Haupt 424,981
Wagon bed rack, M. C. Craig 425,303
Warping machines, electric stop motion for, J. E. Prest 424,997
Washing machine, D. M. Felts 425,127
Washing machine, H. T. Royster 425,000
Watch bow fastener, C. M. Fogg 425,375
Watch bow fastener, F. Mink 425,382
Watch case, F. Mink 425,383
Watch dials, manufacture of, D. R. Buchanan 425,020
Watch, stem winding, A. H. Potter 425,342
Water closet tank, A. F. Blesch 425,288
Water heater, F. P. Blodgett 425,062
Waterproof collar, etc., J. R. France 425,129
Waterway gate, R. A. Lang 425,231
Welding, electric, C. L. Coffin 425,161
Wheel. See Vehicle wheel.
Winding trimmings, ruchings, etc., reel for, G. H. Taylor 425,392
Windlass, E. & F. E. Perkins 425,185
Wires, device for shielding and protecting, H. E. Penney 425,107
Wood bundling machine, T. F. Buckley 425,064
Wood, etc., machine for sorting disintegrated, L. Piette 425,341
Woodworking clamp, H. Cone 424,960
Wooden vessel, W. Heiser 425,032
Wrench. See Pipe wrench.
Wringer. See Clothes wringer.
Zinc sulphide, making, A. Keiller 425,081

DESIGNS.

Button, stair, J. H. Jolley 19,754
Ceiling, W. R. Kinnear 19,755
Lamp, coach, F. C. Cannon 19,751, 19,752
Puzzle board, G. W. Spayd 19,756
Type, font of printing, W. W. Jackson 19,753
Vending apparatus, front frame for, C. H. Thompson 19,757

TRADE MARKS.

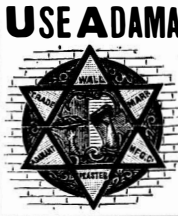
Baseballs, J. C. Richard 17,739
Button fasteners, three-pronged, Heaton-Peninsular Button Fastener Company 17,749
Candy and rock-candy sirup, rock, Dryden & Palmer 17,733
Canned fish, meat, vegetables, and fruit, W. B. Timms 17,757
Copper, refined, Lewisohn Brothers 17,735
Corsets, Stern Brothers 17,756
Embrocation, D. D. Tomlinson 17,740
Fertilizers, phosphate, Feddeman & Earle 17,734
Fruit puddings and fruit jellies, W. P. Clotworthy 17,745
Galvanic batteries, Crosby Electric Company 17,746
Games and toys, G. F. Newland 17,753
Ginghams, J. Farnum & Co 17,748
Kid, glazed, F. S. Kaliske 17,750
Perfumery, Ostheimer Brothers 17,738
Roofing plate, metal, Merchant & Co 17,737
Skin beautifier and wrinkle eradicator, R. Lundy 17,736
Stone, basic cement forming artificial, L. Enricht *et al* 17,747
Tea, Powell & Bennett 17,754
Tea, Japan, G. W. Lane & Co 17,751, 17,752
Tea or coffee or preparations thereof, Santha Tea Company 17,755
Teas and coffees, Chase & Sanborn ..... 17,741 to 17,744

A printed copy of the specification and drawing of any patent in the foregoing list will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian Patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

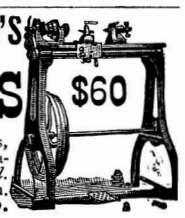
Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

USE ADAMANT WALL PLASTER

It is **Hard, Dense, and Adhesive.** Does not *check or crack.* It is impervious to wind, water, and disease germs. It dries in a few hours. It can be applied in any kind of weather. It is in general use. Licenses granted for the mixing, using, and selling.
Address **ADAMANT MFG. CO.**
309 E. Genesee St., Syracuse, N. Y.

Patent Foot Power Machinery
Complete Outfits.

Wood or Metal workers without steam power, can successfully compete with the large shops, by using our New **LABOR SAVING Machinery,** latest and most improved for practical shop use, also for Industrial Schools, Home Training, etc. Catalogue free.
Seneca Falls Mfg. Co.
695 Water Street, Seneca Falls, N. Y.

INDEX PLATES. — A PAPER OF great value to amateur mechanics, giving full directions for making an inexpensive index plate for direct use upon an ordinary lathe. With 3 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **732.** Price 10 cents. To be had at this office and from all newsdealers.

SEBASTIAN, MAY & CO'S
Improved Screw Cutting
Foot & Power **LATHES**

$60
Drill Presses, Chucks, Drills, Dogs, and machinists' and amateurs' outfits. *Lathes on trial.* Catalogues mailed on application.
165 W. 2d St., Cincinnati, O.

EDISON LAMPS

For Decorative, Experimental, Surgical, Dental, and other purposes. From ¼ to 36 candle power. From 2½ to 40 volts. Catalogue on application.
EDISON LAMP CO.
Harrison, N. J.

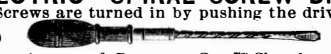
PRIMARY BATTERIES
FOR RUNNING
INCANDESCENT LAMPS,
From 25 to 300 hours with ONE change of solution.
Send for Circulars and Price List.
JAMES H. MASON,
118-120 Park Ave., Brooklyn, N. Y.

ICE-HOUSE AND REFRIGERATOR. Directions and Dimensions for construction, with one illustration of cold house for preserving fruit from season to season. The air is kept dry and pure throughout the year at a temperature of from 34° to 36°. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. **116.** Price 10 cents. To be had at this office and of all newsdealers.

CROSBY POP SAFETY VALVE
WATER RELIEF VALVE
IMPROVED STEAM GAGE
STEAM ENGINE INDICATOR
Single Ball Chime Whistle, and all instruments used in connection with Steam, Air and Water.
Sole Agents for Clark's Lunen Fire Hose.
NEW YORK. LONDON.
CROSBY STEAM GAGE & VALVE CO. **93 Oliver St. Boston, Mass.**

STEEL TYPE for TYPEWRITERS,
Stencils, Steel Stamps, Rubber and Metal Type Wheels.
New York Stencil Works, Mfrs.
100 Nassau Street, New York.

ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, **59.** Price 10 cents. To be had at this office and of all newsdealers.

"ELECTRIC" SPIRAL SCREW DRIVER
Screws are turned in by pushing the driver.
$1.25  $1.25
THE ALFORD & BERKELE CO., 77 Chambers St.,
Sample, by mail, $1. P. O. Box 2002, New York City.

Barnes' Foot-Power Machinery
Complete outfits for Actual Workshop Business. A customer says: "Considering its capacity and the accuracy of your No. 4 Lathe, I do not see how it can be produced at such low cost. The velocipede foot-power is simply elegant. I can turn steadily for a whole day, and at night feel as little tired as if I had been walking around." Descriptive Price List Free.
W. F. & JOHN BARNES CO.,
1999 RUBY ST., Rockford, Ill.

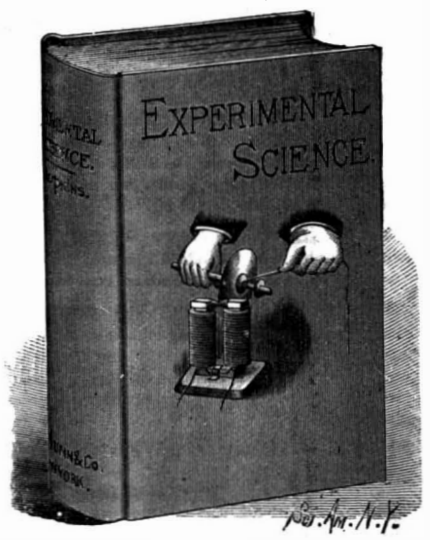
ELECTRO MOTOR, SIMPLE, HOW TO make. By G. M. Hopkins.—Description of a small electro motor devised and constructed with a view to assisting amateurs to make a motor which might be driven with advantage by a current derived from a battery, and which would have sufficient power to operate a foot lathe or any machine requiring not over one man power. With 11 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **641.** Price 10 cents. To be had at this office and from all newsdealers.

Fay's Patent Spring Dividers
With new quick adjusting automatic closing spring nut. Micrometer Caliper Squares, Spring Dividers, Bevel Protractors, Surface Gauges, Combination Squares, Hardened Steel Squares, Steel Rules etc. Send 2-cent stamp for illustrated list.

PRICE LIST.			
2½	in.	solid nut,	$1.00
3	"	" "	1.00
4	"	spring "	1.25
5	"	" "	1.25
6	"	" "	1.50

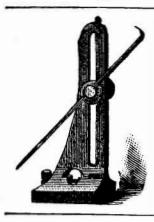
L. S. STARRETT, ATHOL, MASS.
MANUFACTURER OF FINE TOOLS.

RUBBER ROOFING.
UNEQUALED
For House, Barn, Factory, etc.
For Shed or Outbuilding.
Excellent roof complete. Any one can lay it.
$2.00 per 100 Sq. Feet.
Sample free if you state size of roof.
42 West Broadway, New York City.
INDIANA PAINT & ROOFING CO.

NOW READY.
Experimental Science,


BY GEO. M. HOPKINS.
740 Pages. 680 Illustrations.
PRICE, by mail, postpaid, ... $4.00
SEND for FREE ILLUSTRATED CIRCULAR and Table of Contents.
MUNN & CO. Publishers,
Office of The Scientific American,
361 Broadway, New York.

GEARS
BRASS RACKS & PINIONS.
8 Medford Street,
Circular Free. T. F. WELCH, BOSTON.


IMPROVED SURFACE GAUGE.
Try and Center Squares, Standard Steel Rules, Steel Caliper Rules, Universal Bevels, Bevel Protractors, Depth Gauges, Screw Pitch and Centre Gauges, Hardened Steel Squares, Graduated Steel Squares, Spring Calipers, Hardened Straight Edges, etc.
☞ *Illustrated Catalogue and Price List free.*
Standard Tool Co., - Athol, Mass.

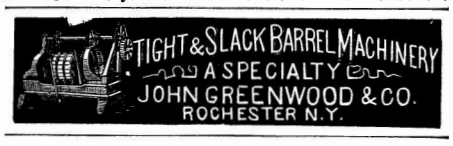
TO BUSINESS MEN
The value of the SCIENTIFIC AMERICAN as an advertising medium cannot be overestimated. Its circulation is many times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading rooms of the world. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. This he has when he advertises in the SCIENTIFIC AMERICAN. And do not let the advertising agent influence you to substitute some other paper for the SCIENTIFIC AMERICAN, when selecting a list of publications in which you decide it is for your interest to advertise. This is frequently done, for the reason that the agent gets a larger commission from the papers having a small circulation than is allowed on the SCIENTIFIC AMERICAN.
For rates see top of first column of this page, or address **MUNN & CO., Publishers,**
361 Broadway, New York.

BARREL MACHINERY.
E. & B. HOLMES
BUFFALO, N. Y.
ALSO A FULL LINE OF WOOD WORKING MACHINERY.

REGISTERED TRADE MARK, 13,831.
Blake's Belt Stud.

PATENTED JULY 31, 1883.
The Strongest, Cheapest, and Best Fastening for Leather and Rubber Belting. Beware of poor imitations. *None genuine without this Trade Mark and PICTURE* on the package.
Greene, Tweed & Co.
83 Chambers St.,
NEW YORK.

THE PENNA. DIAMOND DRILL & MFG. CO.
BIRDSBORO, PA., Builders of High Class Steam Engines, Diamond Drilling and General Machinery. Flour Mill Rolls Ground and Grooved.



USEFUL BOOKS.
Manufacturers, Agriculturists, Chemists, Engineers, Mechanics, Builders, men of leisure, and professional men, of all classes, need good books in the line of their respective callings. Our post office department permits the transmission of books through the mails at very small cost. A comprehensive catalogue of useful books by different authors, on more than fifty different subjects, has recently been published for free circulation at the office of this paper. Subjects classified with names of author. Persons desiring a copy, have only to ask for it, and it will be mailed to them. Address,
MUNN & CO., 361 Broadway, New York.

© 1890 SCIENTIFIC AMERICAN, INC.

The New Metal of the Present, no longer "The Metal of the Future."

Aluminium!

JUST READY.

ALUMINIUM.—Its History, Occurrence, Properties, Metallurgy and Applications, including its Alloys. By Joseph W. Richards, M.A., A.C., Instructor in Metallurgy at the Lehigh University. Second edition, revised and greatly enlarged. Illustrated by 28 engravings and two diagrams. 311 pages. 8vo.

Price $5.00, *by mail, free of postage to any address in the World.*

CONTENTS.—CHAPTER I. History of Aluminium. II. Occurrence of Aluminium in Nature. III. Physical Properties of Aluminium. IV. Chemical Properties of Aluminium. V. Properties and Preparation of Aluminium Compounds. VI. Preparation of Aluminium Compounds for Reduction. VII. The Manufacture of Sodium. VIII. The Reduction of Aluminium Compounds from the Standpoint of Thermal Chemistry. IX. Reduction of Aluminium Compounds by means of Potassium or Sodium. X. Reduction of Aluminium Compounds by means of Potassium or Sodium (Continued). XI. Reduction of Aluminium Compounds by the Use of Electricity. XII. Reduction of Aluminium Compounds by other means than Sodium or Electricity. XIII. Working in Aluminium. XIV. Alloys of Aluminium. XV. Aluminium-Copper Alloys. XVI. Aluminium-Iron Alloys. XVII. Analysis of Aluminium and Aluminium Alloys. Index.

☞ *A circular of 4 pages, 4to, showing the full Table of Contents of this thoroughly revised and recast treatise, showing the state of the industry up to* 1890, *and which has played an important part in the rapid development of this New Metal, will be sent free, and free of postage, to any one in any part of the world who will furnish his address.*

☞ *Our new and revised Catalogue of Practical and Scientific Books,* 86 *pages,* 8vo, *and our other Catalogues, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish us with his address.*

HENRY CAREY BAIRD & CO.,
INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS
810 Walnut St., Philadelphia, Pa., U. S. A.

FOR SALE.

Owing to dissolution of partnership,

C. H. DE LAMATER & CO.

have closed their extensive manufactory at the foot of West 13th Street, New York, disposed of Hot Air Pumping Engine and Steam Pump business to the DE LAMATER IRON WORKS (incorporated 1889), and to close out the remainder, offer for sale a very desirable lot of

Lathes, Planers, Drilling, Shaping, Slotting, Boring, Cutting Off, Nut Tapping, Bolt Cutting, and Milling Machines, Gear Cutters, Emery Tool Grinders, Screw Machines, Vises, Lathe and Planer Tools, Drills, Taps,
And a variety of
Small Tools, Boiler Punching and Shearing Machines, with lot of Small Tools, Anvils, Sledges, Tongs,
Blocks, Rope, Bolts, Nuts, Washers, Packing, Pipe, Fittings, Brass Valves, Bar Iron and Steel, Steam Hammers, and three Rider Cut-off Engines.

FOREIGN PATENTS

THEIR COST REDUCED.

The expenses attending the procuring of patents in most foreign countries having been considerably reduced the obstacle of cost is no longer in the way of a large proportion of our inventors patenting their inventions abroad.

CANADA.—The cost of a patent in Canada is even less than the cost of a United States patent, and the former includes the Provinces of Ontario, Quebec, New Brunswick, Nova Scotia, British Columbia, and Manitoba.

The number of our patentees who avail themselves of the cheap and easy method now offered for obtaining patents in Canada is very large, and is steadily increasing.

ENGLAND.—The new English law, which went into force on Jan. 1st, 1885, enables parties to secure patents in Great Britain on very moderate terms. A British patent includes England, Scotland, Wales, Ireland and the Channel Islands. Great Britain is the acknowledged financial and commercial center of the world, and her goods are sent to every quarter of the globe. A good invention is likely to realize as much for the patentee in England as his United States patent produces for him at home, and the small cost now renders it possible for almost every patentee in this country to secure a patent in Great Britain, where his rights are as well projected as in the United States.

OTHER COUNTRIES.—Patents are also obtained on very reasonable terms in France, Belgium, Germany, Austria, Russia, Italy, Spain (the latter includes Cuba and all the other Spanish Colonies), Brazil, British India Australia, and the other British Colonies.

An experience of over FORTY years has enabled the publishers of THE SCIENTIFIC AMERICAN to establish competent and trustworthy agencies in all the principal foreign countries, and it has always been their aim to have the business of their clients promptly and properly done and their interests faithfully guarded.

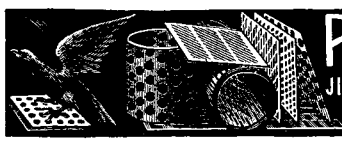
A pamphlet containing a synopsis of the patent laws of all countries, including the cost for each, and other information useful to persons contemplating the procuring of patents abroad, may be had on application to this office.

MUNN & CO., Editors and Proprietors of THE SCIENTIFIC AMERICAN, cordially invite all persons desiring any information relative to patents, or the registry of trade-marks, in this country or abroad, to call at their offices, 361 Broadway. Examination of inventions, consultation, and advice free. Inquiries by mail promptly answered.

Address, **MUNN & CO.,**
Publishers and Patent Solicitors,
361 Broadway, New York.

BRANCH OFFICES: No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.

AGENTS WANTED by an old reliable firm; large profits, quick sales, SAMPLE FREE. A rare opportunity. Geo. A. Scott, 842 Broadway, N. Y.



PERFORATED METALS for MINING SCREENS, COAL AND ORE SEPARATORS, REVOLVING AND SHAKING SCREENS, JIGS & STAMP BATTERIES FOR ALL KINDS OF MILLING & MINING MACHINERY, & ALL OTHER USES
HARRINGTON & KING PERFORATING CO. CHICAGO.

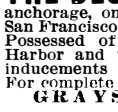
THE "FISHKILL" CORLISS ENGINE
COMBINING A MAXIMUM OF ECONOMY, EFFICIENCY, AND DURABILITY.
Fishkill Landing Machine Co., Fishkill-on-Hudson, N. Y.

SPECIAL MACHINERY and Appliances executed with perfect workmanship. Entire confidence and interest guaranteed. Draughting, Patternmaking, Planing, Turning, Drilling, etc., etc. WM. GRUNOW, JR., 204 & 206 East 43d St., New York.

CARY & MOEN CO. STEEL WIRE OF EVERY DESCRIPTION & STEEL SPRINGS. 234 W. 29. ST. NEW YORK CITY

IMPERIAL P. & P. Stamp with name 10 cts. Self-Inker 20c.
CLUB of 14 postpaid for $1 bill. Marks Linen, Cards, Papers, Everything. New Agents make BIG Money. Terms Free.
THALMAN MFG. CO., No. 412 Balt. St Baltimore, Md.

PLANCHETTE.—DESCRIPTION AND illustration of a simple apparatus that once attracted great attention; with an explanation of its action. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 729. Price 10 cents. To be had at this office and from all newsdealers.



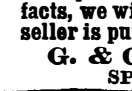
New VINEYARD. BICYCLES
All Steel, rubber tire
High grade,—cowhorn bars, spade handles, Kirkpatrick saddle; Warranted one year.
50-in. worth $55, for $32 | 44-in. worth $40, for $22
48-in. worth $50, for $27 | 42-in. worth $35, for $20
46-in. worth $45, for $25 | 38-in. worth $30, for $17
CATA. FREE. Tangent spokes $1 extra. Easy payments. Agts. wanted
ROUSE, HAZARD & CO., 16 G Street, Peoria, Ill.

A NEW CATALOGUE OF VALUABLE PAPERS
Contained in SCIENTIFIC AMERICAN SUPPLEMENT, sent *free of charge* to any address.
MUNN & CO., 361 Broadway, New York.

$10.00 to $50.00 per night. A light and profitable business. **Magic Lanterns and Views** of popular subjects. Catalogues on application. Part 1 Optical, 2 Mathematical, 3 Meteorological, 4 Magic Lanterns, etc.
L. MANASSE, 88 Madison Street, Chicago, Ill.

SECTIONAL INSULATED AIR COVERINGS FOR PIPES, BOILERS, DRUMS, AND ALL OTHER HOT & COLD SURFACES
SHIELDS & BROWN CO. 143 WORTH ST. NEW YORK. 240 & 242 RANDOLPH ST. CHICAGO.
ASBESTOS, CEMENT, PACKING, SHEATHING &C.

ON MECHANICAL ENGINEERING in Electrical Industries.—An address by Prof. John Perry, D.Sc., F.R.S., discussing the importance to electricians of a thorough knowledge of engineering. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 727. Price 10 cents. To be had at this office and from all newsdealers.



DIVING APPARATUS
AND FIRE DEPARTMENT SUPPLIES
A. J. MORSE & SON 140 CONGRESS ST. BOSTON.

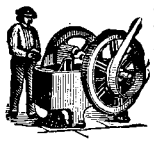
THE BEST LIME KILN KNOWN
or no pay. C. D. PAGE, Rochester, N. Y.

VOLNEY W. MASON & CO.,
FRICTION PULLEYS CLUTCHES and ELEVATORS
PROVIDENCE, R. I.

SAVE MONEY. Before you buy a **BICYCLE or TYPEWRITER,** Send to A. W. GUMP & CO., DAYTON, OHIO, for prices. New Bicycles at reduced prices, and 400 second-hand ones. BICYCLES, GUNS and TYPE-WRITERS taken in EXCHANGE

HOME-MADE INCUBATOR.—PRACTICAL directions for the manufacture of an effective incubator that has been carefully tested and found to perform all that may be reasonably expected; with directions for operating. With 4 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 630. Price 10 cents. To be had at this office and from all newsdealers.

MOSS ENGRAVING CO. 535 PEARL ST. NEW YORK. cor. Elm. St.
ENGRAVINGS FOR BOOKS, NEWSPAPERS and CIRCULARS
SEND GREEN STAMP FOR CIRCULAR. SEND PHOTOGRAPH, DRAWING OR PRINT FOR ESTIMATE.
When writing to us please mention SCIENTIFIC AMERICAN



ROCK BREAKERS AND ORE CRUSHERS
We manufacture and supply at short notice and lowest rates, Stone and Ore Crushers, containing the invention described in Letters Patent issued to Eli W. Blake, June 15, 1858, together with NEW AND VALUABLE IMPROVEMENTS, for which Letters Patent were granted May 11th and July 20th, 1880, to Mr. S. L. Marsden. All Crushers supplied by us are constructed under these patents of Mr. Marsden, who for the past twenty years has been connected with the manufacture of Blake Crushers in this country and England.
FARREL FOUNDRY & MACHINE CO., Manufacturers, ANSONIA, CONN.
COPELAND & BACON, Agents, NEW YORK and PHILADELPHIA.

The Manufacturers OF THE United States
For Domestic and Foreign Trade.

Containing Names and Addresses of 100,000 Manufacturers of 20,000 Articles in 178 Classified Trades in the United States.

A complete Reference Book for buyers and sellers in all trades, showing where any article of American manufacture can be purchased direct.

Price, by mail..... **$15.00**

Send for circular showing classified list of articles and manufactures.

For sale by **MUNN & CO.,**
Publishers of SCIENTIFIC AMERICAN,
361 Broadway, New York.

$10 CASH An investment of this amount and $5 per month will realize to the purchaser 100 per cent. in two years. One of the best suburban properties in Tacoma, Wash., on the line of street railway connecting two flourishing cities. Price of lots $700; corner lots, $125. Write for maps and particulars. A liberal concession made to parties buying in large quantities for cash. Reference, Washington National Bank. E. N. OUIMETTE, 1316 Pacific Ave., Tacoma, Washington.

GRAYS HARBOR

Washington. The Duluth of the Pacific Coast. **RAILROAD TERMINUS** of the Hunt System, now being pushed through to Grays Harbor from the Walla Walla wheat fields. Rich tributary country, wheat, coal, hay, and timber. Largest body of government land in Washington, subject to homestead, tributary. Two-fifths of all timber in Washington tributary; the future seat of great lumber manufacturing and other industries. **THE BEST HARBOR** north of San Francisco, 18 square miles of anchorage, only 10 miles of towage; 350 miles nearer San Francisco and the worlds markets than Tacoma. Possessed of unparalleled natural resources, Grays Harbor and the Grays Harbor Country offers great inducements to settlers, investors, and business men. For complete particulars address
GRAYS HARBOR COMPANY,
Grays Harbor, Washington.

DEAFNESS & HEAD NOISES CURED by Peck's INVISIBLE TUBULAR EAR CUSHIONS. Over 1 er heard, Comfortable. Successful where all Remedies FAIL. Ills. book & proofs free. Address F. HISCOX, 853 Broadway, New York.

WEBSTER'S UNABRIDGED ANCIENT EDITION.

A so-called "Webster's Unabridged Dictionary" is being offered to the public at a very low price. The body of the book, from A to Z, is a cheap reprint, page for page, of the edition of 1847, which was in its day, a valuable book, but in the progress of language for over FORTY YEARS, has been completely superseded. It is now reproduced, broken type, errors and all, by photo-lithograph process, is printed on cheap paper and flimsily bound. A brief comparison, page by page, between the reprint and the latest and enlarged edition, will show the great superiority of the latter. These reprints are as out of date as a last year's almanac. No honorable dealer will allow the buyer of such to suppose that he is getting the Webster which to-day is accepted as the Standard and THE BEST,—every copy of which bears our imprint as given below.

☞ **If persons who have been induced to purchase the "Ancient Edition" by any misrepresentations will advise us of the facts, we will undertake to see that the seller is punished as he deserves.**

G. & C. MERRIAM & CO.
SPRINGFIELD, MASS.

FOR 26 CENTS in stamps, we will send this beautiful **Gold Plated Ring** Heavy to any address. Not like the cheap rings advertised. This ring is warranted to wear for years. This wonderful offer is made to introduce our watches and will never appear again. Order immediately. Address THE WARREN COMPANY, Minneapolis, Minnesota.

CELEBRATED PIONEER RUBBER PACKING. SUTTON RING PACKING. POSITIVELY ANTI FRICTION, SPECIALLY ENDORSED FOR HIGH SPEED ENGINES. SEND FOR SAMPLE PACKAGE AND PARTICULARS TO ERIE RUBBER Co ERIE PA U.S.A.

ICE and REFRIGERATING MACHINES
The Pictet Artificial Ice Company (Limited), Room 6, Coal & Iron Exchange, New York.

PROPOSALS.

Department of the Interior, WASHINGTON, March 13, 1890.—Sealed proposals for erecting an engine house and impounding reservoir, furnishing pumping engines and boilers, cast and wrought iron piping, special castings, fittings, valves, lead, jute, and for excavation and performing the work necessary to complete the pumping station on the Hot Springs Reservation, at Hot Springs, Ark., will be received at this Department until 12 o'clock M., Wednesday, April 30, 1890, when they will be opened. Blank forms of proposal, embracing specifications, together with drawings showing details, may be obtained upon application to the Department or the Superintendent of the Reservation at Hot Springs, Ark. JOHN W. NOBLE, *Secretary.*

$500.00 PREMIUM.

TENDERS WANTED.

Tenders will be received by the City of Brandon, Manitoba, not later than the fifteenth (15) day of May, 1890, for the following: "Plans for a system of water works for the City of Brandon, including sources of supply, plans of works, estimates of costs, running expenses and receipts, and the question of private or municipal control. Also plans for a system of sewerage for the said City of Brandon in connection with such water works, estimates of costs, etc. The population of the city is about four thousand (4,000). A premium of five hundred dollars ($500) will be paid by the Council of the City of Brandon for the plans and estimates accepted by the Council.

ARCHITECTURAL BOOKS.

Useful, Beautiful, and Cheap.

To any person about to erect a dwelling house, or stable, either in the country or city, or any builder wishing to examine the latest and best plans for a church, school house, club house, or any other public building of high or low cost, should procure a complete set of the ARCHITECTS' AND BUILDERS' EDITION of the SCIENTIFIC AMERICAN.

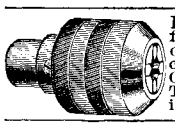
The information these volumes contain renders the work almost indispensable to the architect and builder, and to persons about to build for themselves they will find the work suggestive and most useful. They contain colored plates of the elevation, plan, and detail drawings of almost every class of building, with specification and approximate cost.

Eight bound volumes are now ready and may be obtained, by mail, direct from the publishers or from any newsdealer. Price, $2.00 a volume. Stitched in paper covers. Subscription price, per annum, $2.50. Address and remit to

MUNN & CO., Publishers,
361 Broadway, New York.

VIOLIN OUTFITS! Sent to any part of the United States on 1 to 3 days' trial before buying. 5 cents brings you our Beautifully Illustrated **100-page** Catalogue of Musical Instruments. Mail orders a specialty.
C. W. STORY, 28 Central St., Boston, Mass.

INVENTORS!—We make anything you want from a Screw to Complete Working Model. Inventions perfected, details worked out, drawings made. Repairs. Circulars sent. A. J. WEED & CO., 92 Fulton St., N. Y.



PATENT DRILL CHUCK, for holding either Straight, Taper, or Square shank tools. Send for catalogue to STANDARD TOOL CO., Cleveland, O., Manufacturers of Twist Drills, Taps, Reamers, Milling Cutters, Chucks & Special Tools.

WANTED.—A First-class Machinist and Tool Maker. Light work, good pay. Steady employment to the right party, for factory at Leominster, Mass. Address or call on H. M. RICHARDSON & CO., 241 Cambridge Street, Boston.

Paragon, Duplex, Universal, Anvil Drawing Papers, Tracing Cloth, Parchment Tracing Paper, Mounted Papers, Cross-section Papers. Samples on application.

INTRODUCING ENTIRELY NEW PRINCIPLES.

Pat. Mar. 19, 1889. THE OLD STYLE.

THE ACME LINK BELT
IS MADE ONLY BY THE
Page Belting Company, Concord, N. H.
BRANCHES: Boston, New York, Chicago, San Francisco. Also, manufacturers of all the staple grades of Leather Belting and Lacing. Send for Illustrated Catalogue—a valuable treatise on belting, Free.

The Scientific American

PUBLICATIONS FOR 1890.

The prices of the different publications in the United States, Canada, and Mexico are as follows:

RATES BY MAIL.

The Scientific American (weekly one year	$3.00
The Scientific American Supplement (weekly), one year	5.00
The Scientific American, Spanish Edition (monthly) one year	3.00
The Scientific American, Architects and Builders Edition (monthly), one year	2.50

COMBINED RATES.

The Scientific American and Supplement,	$7.00
The Scientific American and Architects and Builders Edition,	5.00
The Scientific American, Supplement, and Architects and Builders Edition,	9.00

Proportionate Rates for Six Months.

This includes postage, which we pay. Remit by postal or express money order, or draft to order of
MUNN & CO., 361 Broadway, New York.

WORKING MODELS & LIGHT MACHINERY. INVENTIONS DEVELOPED. Send for Model Circular. Jones Bros. E Co., Cin'ti. O.

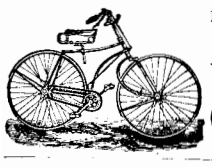
© 1890 SCIENTIFIC AMERICAN, INC.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Victor Bicycles!



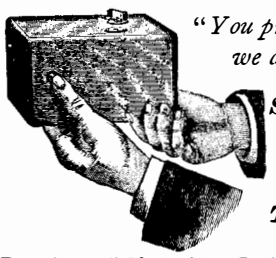
For pleasure, business, recreation, and for anything you could use a bicycle for.
VICTORS ARE BEST!
Send for catalogue.
Overman Wheel Co., Makers,
Chicopee Falls, Mass.

LEFFEL TURBINE WATER WHEELS
Machine-Molded Gearing.
DRIVING PLANT FOR CABLE RAILWAYS
Shafting, Pulleys, and Hangers.
Mixers and General Outfit for Fertilizer Works
N. B.—Special attention given to Heavy Gearing.
Shipping facilities the best in all directions.
Robt. Poole & Son Co., Baltimore, Md.

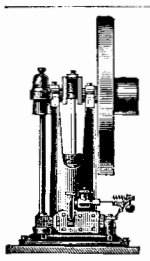
JENKINS STANDARD PACKING!
JENKINS BROS., 71 John St., N. Y.; 105 Milk St., Boston.; 21 North 5th St., Phila.; 54 Dearborn St., Chicago

THE PHONOGRAPH.—A DETAILED description of the new and improved form of the phonograph just brought out by Edison. With 8 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **632**. Price 10 cents. To be had at this office and from all newsdealers.

NEW KODAKS



"You press the button, we do the rest."
Seven New Styles and Sizes
ALL LOADED WITH
Transparent Films.
For sale by all Photo. Stock Dealers.
THE EASTMAN COMPANY,
Send for Catalogue. *ROCHESTER, N. Y.*

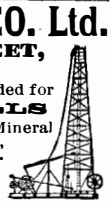


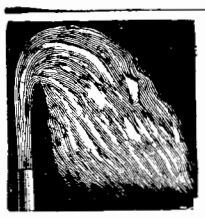
OTTO GAS ENGINES.
Over 25,000 Sold.
Horizontal .....Otto....Gas Engines.
Vertical.....Otto....Gas Engines.
Twin Cylinder..Otto....Gas Engines.
Combined.....Otto..{Gas Engines and Pumps.
Combined.....Otto..{Gas Engines and Dynamos
OTTO GAS ENGINE WORKS,
CHICAGO, PHILADELPHIA.
New York Agency,
18 Vesey Street.

ON GAS ENGINES.—A VALUABLE paper by E. Delamare-Debouteville, touching upon the history of gas motors in general, and describing in detail the "Simplex" engine invented by the author and Mr. Malandin. With 23 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **715** and **716**. Price 10 cents each. To be had at this office and from all newsdealers.

OIL WELL SUPPLY CO. Ltd.

91 & 92 WATER STREET,
Pittsburgh, Pa.,
Manufacturers of everything needed for
ARTESIAN WELLS
for either Gas, Oil, Water, or Mineral Tests, Boilers, Engines, Pipe, Cordage, Drilling Tools, etc. Illustrated catalogue, price lists and discount sheets on request.





ARTESIAN
Wells, Oil and Gas Wells, drilled by contract to any depth, from 50 to 3000 feet. We also manufacture and furnish everything required to drill and complete same. Portable Horse Power and Mounted Steam Drilling Machines for 100 to 600 ft. Send 6 cents for illustrated catalogue. **Pierce Artesian and Oil Well Supply Co.,** 80 Beaver Street, New York.

PATENTS!

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had *forty-one years' experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases. Hints on the Sale of Patents, etc.

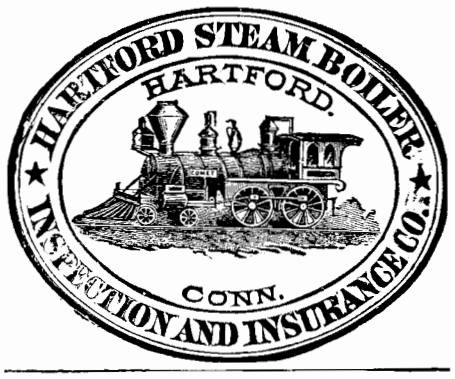
We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,
361 Broadway, New York.

BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.

$85 Lovell Diamond Safety $85
Diamond Frame, Steel Drop Forgings, Steel Tubing, Adjustable Ball Bearings to all Running Parts, including Pedals. Suspension Saddle. Finest material money can buy. Finished in enamel and nickel.
Strictly high grade in every particular. No better machine made at any price.
BICYCLE CATALOGUE FREE.
JOHN P. LOVELL ARMS CO., 147 Washington Street, BOSTON, MASS.

BASE BALL.—A DESCRIPTION OF the great national game of the United States, by an English writer, Jno. Newton Crane, with diagram of the field and 7 illustrations of players. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **693**. Price 10 cents. To be had at this office and from all newsdealers.



THE AMERICAN BELL TELEPHONE CO.
95 MILK ST., BOSTON, MASS.

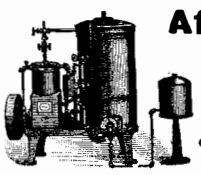
This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30th, 1877, No. 186,787.

The transmission of Speech by all known forms of Electric Speaking Telephones infringes the right secured to this Company by the above patents, and renders each individual user of telephones not furnished by it or its licensees responsible for such unlawful use, and all the consequences thereof, and liable to suit therefor.

"COLUMBIAS"
HIGHEST GRADE ONLY.
Catalogue Free.
POPE MFG. CO. 77 Franklin St., BOSTON.
BRANCH HOUSES: 12 Warren St., NEW YORK. 291 Wabash Ave., CHICAGO.

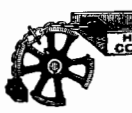
THE ONLY PRACTICAL LOW-PRICED
$15 TYPEWRITER
Catalogue free. Address Typewriter Department, POPE MFG. CO., Boston, New York, Chicago.

THE COPYING PAD.—HOW TO MAKE and how to use; with an engraving. Practical directions how to prepare the gelatine pad, and also the aniline ink by which the copies are made; how to apply the written letter to the pad; how to take off copies of the letter. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. **438**. Price 10 cents. For sale at this office and by all newsdealers in all parts of the country.



Acme Automatic Safety Engine.—"Stationary." Oil Tank.

After being on the Market Four Years
The "ACME" Still Leads!
Sizes One, Two, Three, and Four Horse Power. Arranged for either NATURAL GAS or Kerosene Oil fire, as ordered. No extra insurance required on account of the oil fire. Send for catalogue giving full particulars and prices.
ROCHESTER MACHINE TOOL WORKS, Brown's Race, ROCHESTER, N. Y.



HARRISON CONVEYOR!
For Handling Grain, Coal, Sand, Clay, Tan Bark, Cinders, Ores, Seeds, &c.
Send for Circulars. BORDEN, SELLECK & CO., {Sole Manufacturers, Chicago, Ill.

IDEAL MUSICAL BOX
Is the Latest Invention in Swiss Musical Boxes It is the Sweetest and Most Perfect Instrument for the Parlor. Any number of tunes can be obtained for it. The Largest Stock of Musical Boxes in America. Send 4 cent stamp for Illustrated Catalogue.
JACOT & SON, 800 BROADWAY, NEW YORK.

PATENT
JACKET KETTLES,

Plain or Porcelain Lined. Tested to 100 lb. pressure. Send for Lists.
BARROWS-SAVERY CO., Limited.
S. Front & Reed Streets Philadelphia, Pa.

WORKING MODELS and Experimental Machinery, metal or wood, made to order by MASON & RAUCH, successors to J. F. Werner, 47 & 49 Centre Street, New York.

FOR SALE.—Three Chemical
ICE MACHINES,
each to make 700 pounds ice per day. Inquire at The De Lamater Iron Works, Foot West 13th Street, New York.

Gates Cornish Rolls Pulverizer

Simple, Durable, Compact, Dustless, and a finished product direct from the machines.
The best Ore Granulator for leaching and concentration.
MANUFACTURE ALSO
Gates Rock and Ore Breakers
Address for Catalogues
GATES IRON WORKS,
50 C So. Clinton St., Chicago.
215 Franklin St., Boston, Mass.

COMPLETE STEAM PUMP
10 SIZES FROM $7 TO $75
FOR WATER SUPPLY TANKS, FIRE PUMPS & ETC.
WRITE FOR PRICES AND DESCRIPTIVE CIRCULARS
VAN DUZEN & TIFT
SOLE MAKERS
CINCINNATI, O.

A Voice from the Golden State.

Engine was shipped to these parties with instructions for setting up and operating.

SANTA PAULA, Cal., Oct. 29, 1889.

CHARTER GAS ENGINE CO., Sterling, Ill.

GENTS:—In reply to your enquiries in letter of the 22d. We are running with the No. 3 Charter Engine purchased of you, a Lathe, a Blower for our Blacksmith Shop, Bolt Cutter, sometimes a Punch and Shears for tank and boiler iron. It will run the whole shop with ease, where we formerly had a 12 H. P. engine and 20 H. P. boiler. Our expense for September was about $33.00, as against $71.80 for fuel alone, for July, say nothing about the engineer and the repairs on boiler, which is no small item when water is bad. Yours respectfully,

HARDISON & STEWART OIL CO.

SIR WILLIAM THOMSON.—AN ACcount of the life and labors of this eminent physicist. With portrait. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **688**. Price 10 cents. To be had at this office and from all newsdealers.

TOOL AGENTS WANTED
in every SHOP in the United States.
Send 10c. for Catalogue, Stationery &c.
THE FINEST OF MECHANICAL TOOLS A SPECIALTY.
C. B. JAMES, 98 LAKE ST. CHICAGO.

Scientific Book Catalogue
RECENTLY PUBLISHED.
Our new catalogue containing over 100 pages, including works on more than fifty different subjects. Will be mailed free to any address on application.
MUNN & CO., Publishers Scientific American, 361 Broadway, New York.

H. W. JOHNS' ASBESTOS STEAM PACKING
Boiler Coverings, Millboard, Roofing. Building Felt, Liquid Paints, Etc.
DESCRIPTIVE PRICE LIST AND SAMPLES SENT FREE
H. W. JOHNS MFG. CO., 87 Maiden Lane, N. Y.

FIRE FELT.
THE NEW NON-CONDUCTING MATERIAL is a Flexible Felt **Made of Pure Asbestos**, in a finely divided fibrous state, indestructible by heat and unexcelled as a Non-Conductor. U. S. Navy tests show it to be superior to Hair Felt in Non-Conducting qualities. Made into sectional form for pipes and into sheets and rolls for large surfaces. Send for Samples.
Asbestos Boiler Coverings, Steam Packings, Asbestos Cloth, Asbestos Building Paper, etc.
THE CHALMERS-SPENCE CO., 419 to 425 E. Eighth St., New York.
BRANCHES:—Philadelphia, Chicago, Pittsburgh, Boston.

CUTLER DESK. BEST IN THE WORLD. A. CUTLER & SON, BUFFALO, N.Y., U.S.A.

SYRACUSE MALLEABLE IRON WORKS
W. B. BURNS PROP'R

OTIS ELEVATORS
THE STANDARD OF THE WORLD
For all kinds of PASSENGER and FREIGHT Elevator Service.
OTIS BROTHERS & CO.
General Offices, - - NEW YORK.

"THE GRAVES" ELEVATORS.
PASSENGER & FREIGHT L. S. GRAVES & SON ROCHESTER N.Y.
NEW YORK, BOSTON, ST. LOUIS, DETROIT.

THE TEACHING OF SCIENCE.—Report of the British Association Committee appointed for the purpose of inquiring into and reporting upon the present methods of teaching chemistry. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **734** and **735**. Price ten cents each. To be had at this office and from all news dealers.

If you are a
CARPENTER,
PATTERNMAKER,
MILLWRIGHT,
CABINETMAKER,
and want First-Class
TOOLS,
Send 8 cents in stamps for our Woodworkers' Tool Catalogue No. 12, 200 pages, 700 illustrations. The most complete catalogue of these goods ever issued.
CHAS. A. STRELINGER & CO., Detroit, Mich.

MALLEABLE AND FINE GRAY IRON ALSO STEEL CASTINGS FROM SPECIAL PATTERNS
THOMAS DEVLIN & CO. FINE TINNING JAPANNING AND FINISHING.
LEHIGH AVE. & AMERICAN ST. PHILA.

THE
Scientific American
ESTABLISHED 1846.
The Most Popular Scientific Paper in the World.

Only $3.00 a Year, including Postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete List of Patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States, Canada or Mexico, on receipt of **three dollars** by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Post Masters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
361 Broadway, New York.

THE
Scientific American Supplement.

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers, and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States and Canada, $5.00 a year, or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year for $7.00. Single copies 10 cents. Address and remit by postal order, express money order, or check,
MUNN & Co., 361 Broadway, N. Y.,
Publishers SCIENTIFIC AMERICAN.

Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming a large and splendid **Magazine of Architecture**, richly adorned with *elegant plates in colors*, and with other fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Sheets of Details, Estimates, etc.

The elegance and cheapness of this magnificent work have won for it the **Largest Circulation** of any Architectural publication in the world. Sold by all newsdealers. $2.50 a year. Remit to

MUNN & CO., Publishers,
361 Broadway, New York.

PRINTING INKS.
THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Phila., and 47 Rose St., opp. Duane St., N. Y.

© 1890 SCIENTIFIC AMERICAN, INC.